THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVI. No. 1434.] LONDON, NOVEMBER 4, 1890. [42ND YEAR. Price 6d.

ROBERT MARSHALL,
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Prices and Analysis of all the Scotch Cannels on application.

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OF VARIOUS SIZES,
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Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
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Under G. R. HISLOP'S PATENTS
All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.
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Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.
Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,
Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

PATENT SULPHATE OF AMMONIA PLANT.
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Makers of the most perfect form of Apparatus for the Manufacture of Sulphate, Muriate, Liquid Ammonia, and Tar Products.
Apparatus already erected have proved more economical in consumption of Fuel, Simplicity, and Cheapness of Working than any known Plant.
Sole Makers of Claus' Patent
SULPHUR RECOVERY PLANT
for recovering Sulphur from Waste Gases containing Sulphuretted Hydrogen.
Testimonials & Estimates on Application.
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IMPROVED DRY GAS-METERS;

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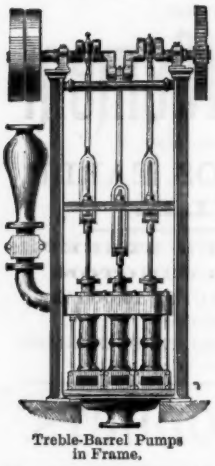
STEAM & HAND PUMPS FOR GAS-WORKS.

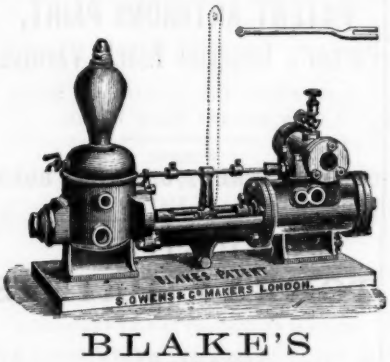
FOR PUMPING TAR, WATER, AND LIQUOR.



Treble-Barrel Pumps in Frame.

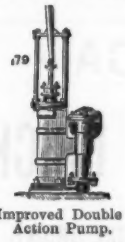
Syphon Pump.

Double-Barrel Force-Pump in Frame.



BLAKE'S PATENT **STEAM PUMPS.**

20,000 IN USE.



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CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description.
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

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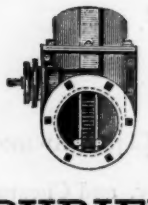
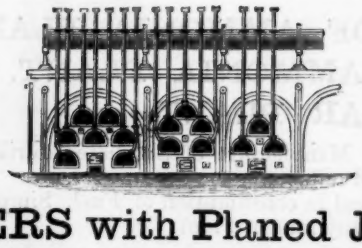
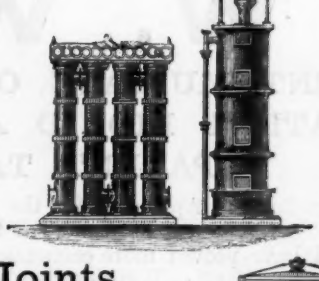
PATENT
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.







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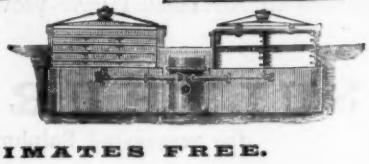

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RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
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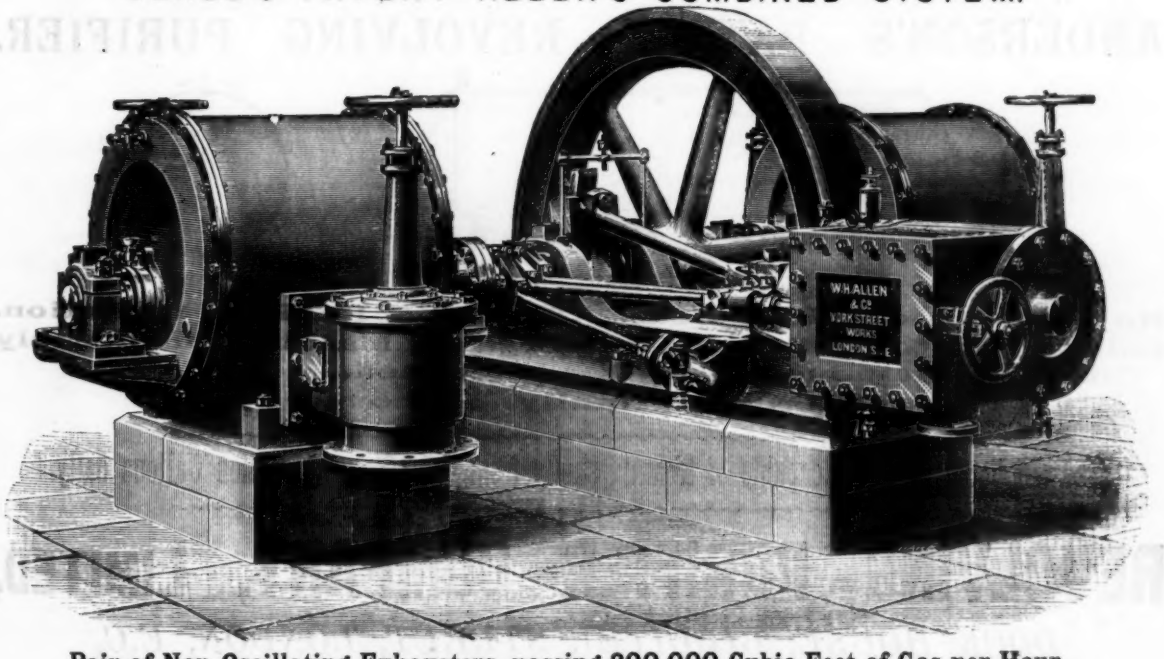

Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

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Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

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THE LARGEST MAKERS IN WALES.

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THE "NUGENT" & "ROBUS" SETTINGS.

ECONOMY WITH DURABILITY GUARANTEED.

HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

Estimates and Particulars for every Description of Retort Extensions and other Work.

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WATER PURIFICATION.

RIVER WATER and SEWAGE EFFLUENT successfully and economically treated in large volumes, by AGITATION WITH METALLIC IRON in

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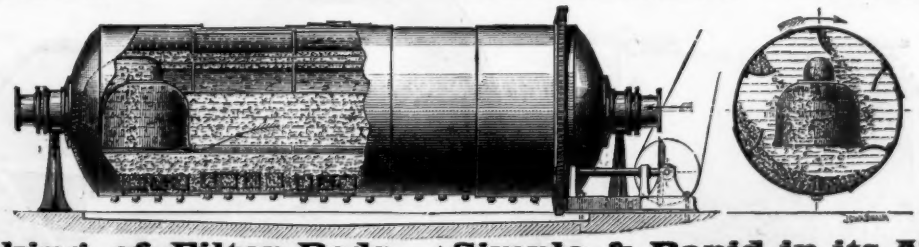

No Choking of Filter-Beds.
Colour due to Peat and Clay entirely Removed.
Simple & Rapid in its Action.
Organic Matter Considerably Reduced.
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Made in Fourteen Sizes, capable of treating singly from **4000** to **1¼** Million Gallons daily.

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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

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GAS PLANT OF EVERY DESCRIPTION.

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Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
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NO SLIP.

NO OSCILLATION.

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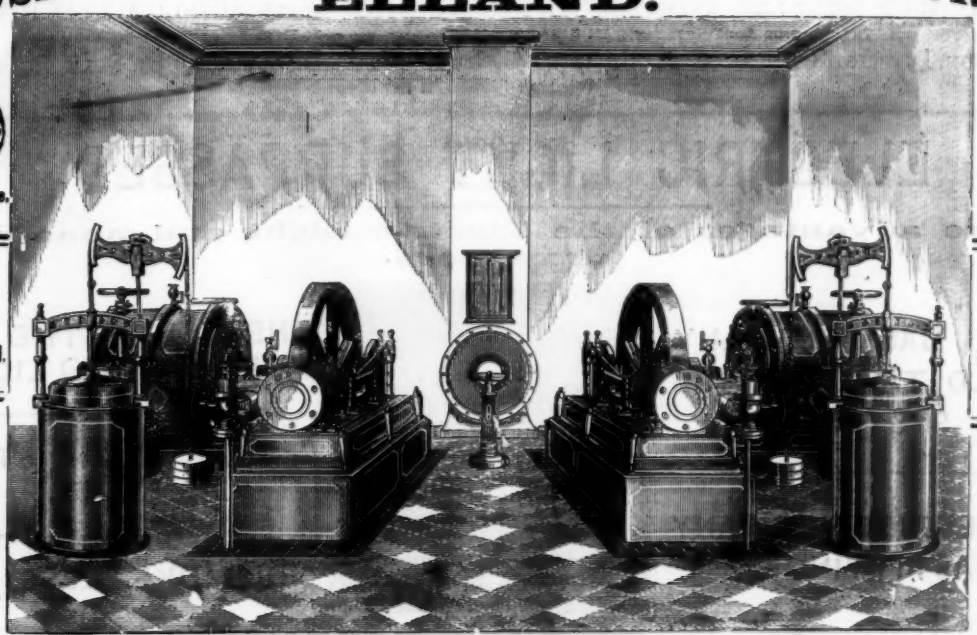

No. 5.
Screw Valve.

NO HIGH SPEED.

STEADY GAUGE.

No. 6.
Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

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MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

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A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

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CASTINGS OF EVERY DESCRIPTION.

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By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

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All the advantages of the Electric Light and none of its drawbacks.

EVERY GAS COMPANY SHOULD TAKE UP THIS SYSTEM.

CAN BE USED WITH ANY GAS-FITTINGS.

ONE-FOURTH THE COST OF ELECTRIC LIGHT.

A SOFT, CLEAR, STEADY LIGHT.

NO SMOKE. LESS HEAT.

Gas Companies and Gas Engineers placed on the best terms. For descriptive circulars and any further particulars, apply to the

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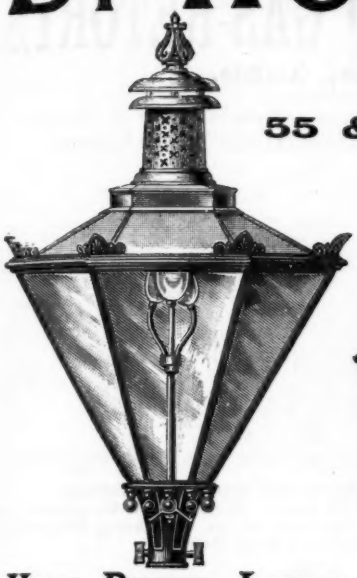
Manufacturers of every description of Gas-Fittings.



HIGH-POWER LAMPS

Of every description, fitted with Copper Tops, Porcelain Cones, and Regulating High-Power Burners.

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STREET LAMPS.

No putty required.
Glass secured by hinged clips. No loose parts.
A new pane of glass can be fitted in a few minutes by any inexperienced person.
Glass can be supplied cut ready for use.
The frames are not liable to be damaged as in ordinary lamps when hacking out a broken pane of glass.
The glass can be removed for repainting.
Several thousands of these are now in use, giving general satisfaction.
They are strongly made, and of the best material.

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SERVICE CLEANSER

For Removal of Obstructions in Gas Service Pipes.

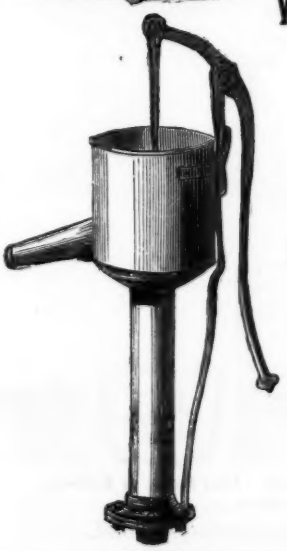
They are constructed with Air Vessels of great strength and capacity for storing a large quantity of air, which can be delivered at a pressure of 150 lbs. if necessary.

They are also fitted with Water Fittings, so that about a gallon of liquid can be discharged with the air, for removing Naphthalene from the interior of tubes.

WET AND DRY GAS-METERS.

GAS PRESSURE GAUGES.

WROUGHT OR CAST IRON TUBES AND FITTINGS.



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BRASS.

SYPHON PUMPS,

In Iron, Brass, and Copper.

IRON.

CAST-IRON SYPHONS FOR MAINS.

LAMP-POSTS.

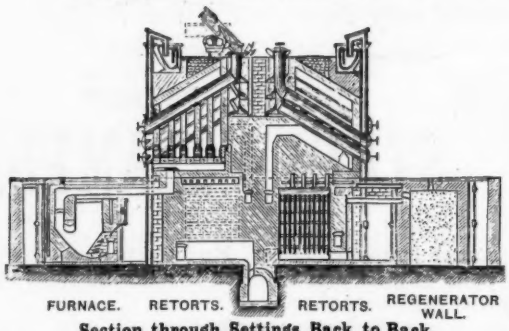
CRADLES AND BRACKETS.

— PRICE LISTS UPON APPLICATION. —

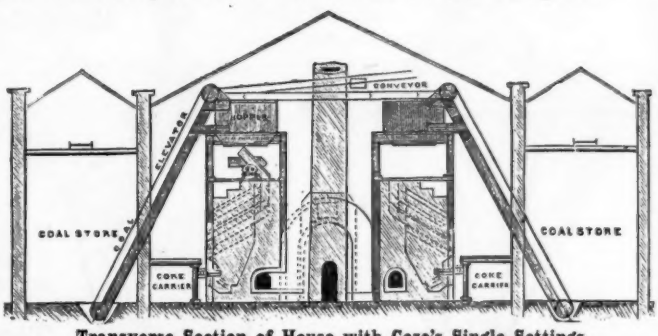
AUTOMATIC SYSTEM OF CHARGING & DRAWING INCLINED GAS-RETORTS.

Gold Medal, Paris Exhibition, 1889.

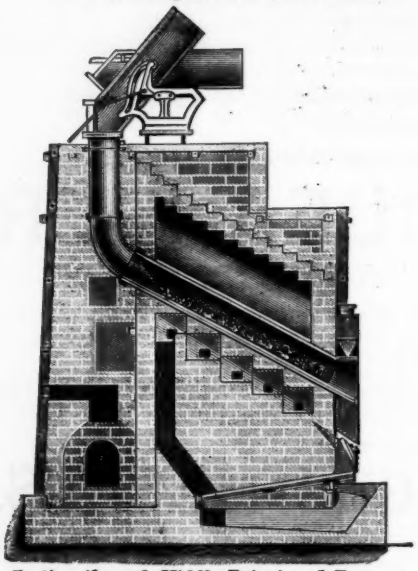
This System of Automatically Charging and Discharging Retorts without machinery or arduous labour is in operation at several places on the Continent and in America, and will shortly be at work in various Gas-Works in England.



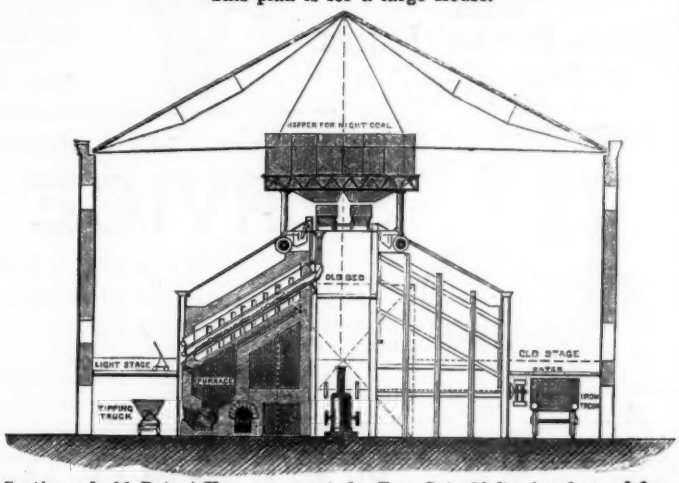
Section through Settings Back to Back. Working off ground floor with Generator under Stage and Regenerator under the Sets.



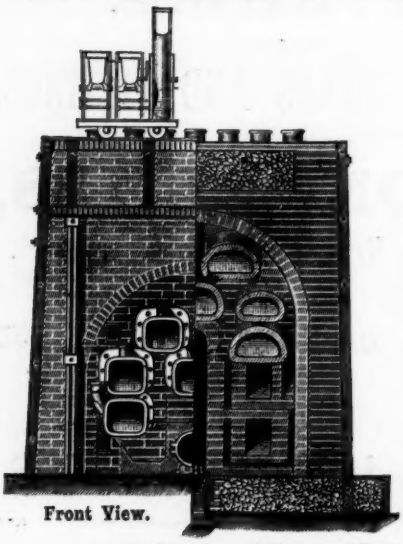
Transverse Section of House with Coze's Single Settings, Showing Method of working Two Single Settings and Distributing the Coal to the Supply Hoppers; the whole of the work being Automatic. This plan is for a large House.



Section through Middle Retort and Furnace.

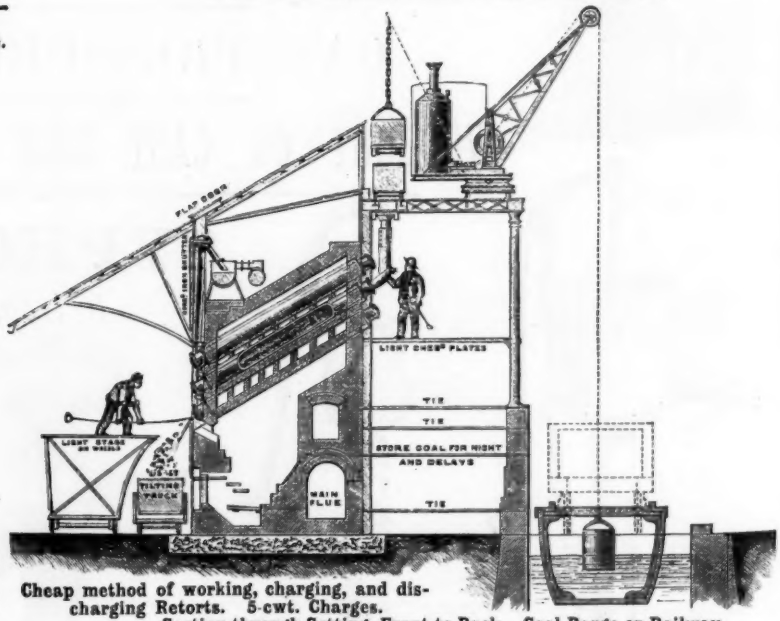


Section of old Retort-House converted, Two Sets 20 fts. in place of One. Modified form, with ordinary Retorts and Fittings.



Front View.

Section through Furnace & Bed.



Cheap method of working, charging, and discharging Retorts. 5-cwt. Charges. Section through Setting, Front to Back. Coal Barge or Railway. Light Corrugated Roof over Sets and at Sides.

These Systems are fully Patented, and any Infringer will be strictly proceeded against.

For further particulars apply to **W. M. KIGHT**, Secretary of **THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86 and 88A, LEADENHALL STREET, LONDON, E.C.**

W. & B. COWAN'S DRY METERS.

Outside Dimensions.

Size.	Depth, Back to Front.	Height, including Unions.	Width, including Unions.
Lights.	Inches.	Inches.	Inches.
2	7¼	13¾	10
3	8⅝	15	11¼
5	9½	16¾	13
10	10¾	19	15
20	13¼	24½	18½
30	16⅛	27½	21¼
50	20¼	33¼	26
60	21	33½	27
80	24¼	40½	31
100	25½	42¼	33¼
150	27¾	50¾	42
200	30	56¾	42¾
250	34¼	58	46¼
300	38¼	63¼	49¼
400	41¾	72¼	56¼
500	46	74	57½

150 Lights and upwards.

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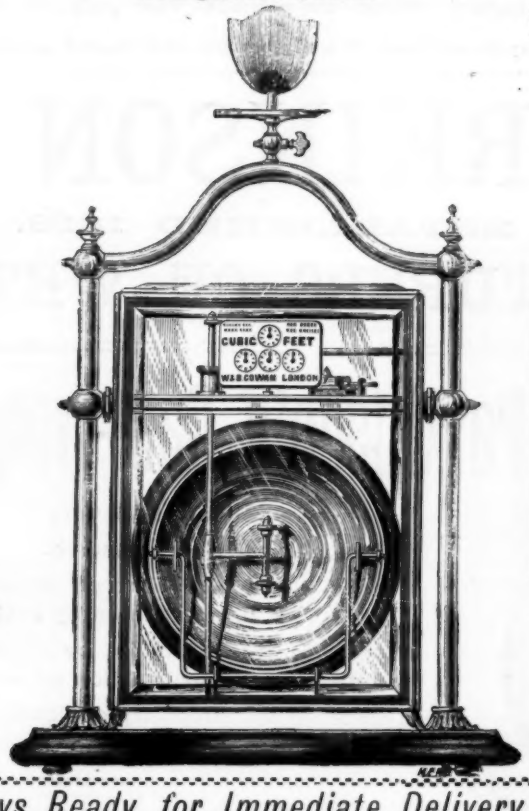
Size.	Bore of Inlet and Outlet.	Per Revolution.	Per Hour.
Lights.	Inches.	Cub. Ft.	Cub. Ft.
2	½	0·083	12
3	⅝	0·125	18
5	¾	0·160	30
10	1	0·3	60
20	1¼	0·5	120
30	1⅝	0·830	180
50	1½	1·428	300
60	1¾	1·6	360
80	2	2·5	480
100	2	2·857	600
150	3	5·0	900
200	3½	6·6	1200
250	3½	7·3	1500
300	4	8·3	1800
400	5	12·0	2400
500	5	14·285	3000



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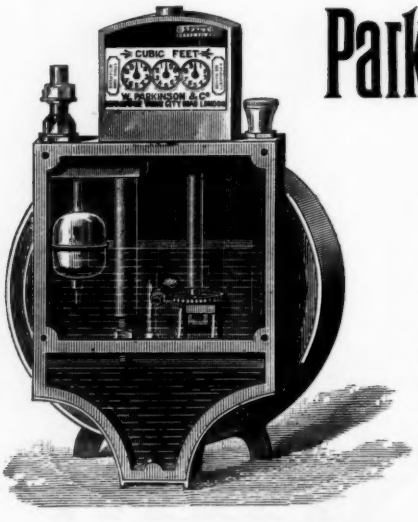

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[See also Advt. p. 978.

CONTENTS.

EDITORIAL NOTES:— PAGE

GAS, LIGHTING, &c.—
The Gas Institute and the Institution of Gas Engineers 935
The End of a Bad Business 936
Water Gas Turned Out of Harrogate 936
A Mistaken Action 936
The Collapse of the New Unionism 937

WATER AND SANITARY AFFAIRS—
Metropolian Authorities and the Water Question—Mr. Binnie's Proposed New Supply 937
Mr. Edward Monson, Assoc. M. Inst. C.E., on the Metropolitan Water Supply 938

ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market 938
Electric Lighting Memoranda 938
A Topic of the Day 939

NOTES:—
Testing Mains before Coating 940
Coal-Conveying Plant 940
A New System of Testing Cement 940

COMMUNICATED ARTICLE:—
The Gadd and Mason Gasholder: A Rejoinder to Mr. W. Gadd's "Review of a Criticism." By F. S. Cripps, Assoc. M. Inst. C.E. 941

TECHNICAL RECORD:—
The Final Report on Lighthouse Illuminants 944

REGISTER OF PATENTS:—
Manufacture of Gas on the "Dinsmore" Plan—Fergusson, J. H. 946
Lighting Gas—Clarke, C. L., and Briggs, A. L. 946
Gas Burners—Leech, A. 946
Patent Notices 947

CORRESPONDENCE:—
The Gas Workers' Union and its Executive 947
The Water Supply Inquiry by the Corporation of London 948
Temperature of Gas Flames 948

LEGAL INTELLIGENCE:—
Supreme Court of Judicature—Court of Appeal—Mayor and Corporation of Salford *v.* Lever; The Hunter Commissions 949
High Court of Justice—Queen's Bench Division—
The Mayor, &c., of the City of Manchester *v.* Williams 952
Wilson *v. Financial Times*—The Liquidation of the Nottingham and Derby Water Gas Company 952
Middlesex Assessment Sessions—The Assessment of the North Middlesex and Colney Hatch Gas Companies 953

MISCELLANEOUS:—
Labour Troubles and the Supply of Gas Coal in New Zealand 955
Buenos Ayres Gas Supply—The Works of the Co-operative Gas Company . 955
Meeting of the Ceará Gas Company, Limited 956
Meeting of the Odessa Water-Works Company, Limited 956
The New Gas-Works for Rawmarsh 957
Bradford Corporation Gas and Water Supply—Annual Reports of the Committees 957
Lincoln Corporation Gas and Water Supply—Annual Accounts 958
The New Water Supply Scheme for Darwen 958
Notes from Scotland 959
Current Sales of Gas Products 960
Gas and Water Companies' Stock and Share List 960

PARAGRAPHS.—Proposed Increase in the Rebate allowed by the West Middlesex Water Company, 937—Mr. C. V. Bennett, 939—The Incorporated Institution of Gas Engineers, 939—Mr. B. Scott, 939—Southern District Association, 940—The Price of Gas in Brussels, 940—Death of Mr. J. W. Wells, of Cape Town, 941—Denver (Col.) Water-Works, 941—American Gaslight Association, 941—Electric Lighting in Belgium, 941—The Glenboig Union Fire-Clay Company, Limited, 947—Settlement of the Gas Dispute at Monmouth, 947—The Electric Lighting at Barnet, 947—Mr. Binnie's Report on the Water Supply of London, 947—Electric Lighting at Taunton, 947—Alleged Forgery of Debentures of the Havant Gas Company, 948—Mr. Richard W. Allen, 955—Retford Corporation Gas Supply, 955—The Water Supply of Malvern, 955—Australasian Gas Association, Limited, 955—Lighting of Courts and Alleys in Manchester, 955—The Public Lighting Question at Lewes, 955—New Joint-Stock Companies, 956—Quality of the Middlesbrough Water Supply, 956—Appointment of Mr. G. Cockburn as Borough Accountant of Ramsgate, 956—The Edinburgh Exhibition Awards, 958—Miss Kelman, 958—The Bolton Corporation Gas Committee and Gas-Stoves for the Working Classes, 958—Winding Up of the Staffordshire Gas and Coke Company, Limited, 958—Cutting Off Gas without Legal Notice, 958—Damage to Water-Pipes by a Steam-Roller at Folkestone, 958—East Huntingdonshire Water Company, Limited, 960—The Lancashire Coal Trade, 960—Well-Boring Systems and Pumping Machinery at the Brewers' Exhibition, 960—Local Authorities and Electric Lighting, 960—Water-Softening Apparatus at the Brewers' Exhibition, 960—Northern Coal Trade, 960.

TO CORRESPONDENTS.

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TO ADVERTISERS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 4, 1890.

The Gas Institute and the Institution of Gas Engineers.

THE Board of Trade have sanctioned both The Gas Institute and the Institution of Gas Engineers as limited companies without the use of the word "limited" in the title, and the latter undertaking has been duly registered. This is a very important point for both Societies, as they are now practically placed in as good a position as they would have occupied if they had each been able to obtain a Charter of Incorporation, of which there was no likelihood. As we have advocated this step for the Institute from a time when there was no appearance of a second National Association of Gas Engineers, it may perhaps be as well to briefly set out what the Institute has gained thereby. In the first place, it has been led to put its rules in good working order; secondly, these rules have now a legal force, which they previously lacked; and, thirdly, the responsibility of members is limited to the amount of their subscriptions. It is not too much to say that if this had been done a few years ago, The Gas Institute would have stood to-day in a far better position than it actually occupies. When the Executive of the Institute learnt that their application to the Board of Trade had been forestalled by the Executive of the new Institution of Gas Engineers, they decided to oppose the registration of the latter, on the supposition that the Board of Trade would not register two Societies so nearly alike in character. On the same assumption, of course, the new Institution would have been justified in opposing the registration of The Gas Institute; for self-defence comes before friendship. We believe we do not violate any confidence by remarking that it was at one time the opinion of the Solicitor of The Gas Institute that the Board of Trade would not grant two certificates to two Associations with almost identical objects; and that it was this fear, rather than any animosity, that inspired the opposition of The Gas Institute to the registration of the new Society. At any rate, all this uncertainty is ended; and the old and the new organizations find themselves, so far as legal position is concerned, on an exactly equal footing.

There has been a good deal of time lost in this registration business. The publication of the Transactions of The Gas Institute is said to have been delayed on this account; but this is a very small matter indeed. It was supposed that the first ordinary meeting of the new Institution would have been held this autumn; but there is no notification of any such meeting, and time is passing. Even yet, however, it is not too late to call the members together in London. The period that has elapsed since the new Institution showed any signs of life has suggested the question in some quarters as to whether or not it is intended to go on; and perhaps the wish has fathered the thought that not much more is likely to be heard of it. We do not know what foundation can have existed for any such suggestion, beyond the delay in obtaining registration; but this is not the fault of the Executive of the new Institution. Friends of The Gas Institute, who have all along regretted the decision to start a new Society, may naturally hope that nothing will come of it; but we believe they delude themselves. One thing may at least be regarded as certain—that if those who have been instrumental in forming the new Institution should think it not worth their while to go on with it, they will never return to The Gas Institute. This is indisputable; and therefore the withdrawal of the support of these gentlemen from the Institution would simply mean, for such of them as do not belong to a District Institution, their severance from the whole personality of the gas industry. It is unnecessary to cite the names of the gas engineers who happen to be so situated, in order to prove that among them are to be found gentlemen honoured and respected for their character and attainments wherever the renown of British gas engineering has spread. Can the British gas industry, as represented in its technical Associations, afford to lose touch with these men? Can their places be filled by a score or a hundred of possibly worthy, but certainly undistinguished gas managers? The question answers itself.

Wherefore there is no reason why the Institution should not go on and prosper in its independent course. Its membership is small for the present; and this fact is urged as a sign of weakness by those who do not wish for its success. Numbers are not always strength, however; and it is not by any means certain that the Institution, even now, could not bring as numerous an audience to the reading of a good paper, and discuss it at least as well, as The Gas Institute itself. A technical Society is known by its fruits—that is to say, by its "Transactions." A few years will show whether the Institution can justify its existence. The same may be said of the Institute, which is also on its trial. There was an excellent show of papers at Ryde, as we amply acknowledged at the time; but it cannot be said that the discussions were up to the mark.

If this weakness is chronic, it will react upon the papers; for authors will not send their contributions to societies which cannot discuss them authoritatively. In all industries and professions, there are certain men whose views carry weight; and these men will be sought wherever they may be found. They are regarded as authorities to be appealed to, short of whom there is no finality.

For the present it is probable that the most severe competition which the Institution will have to face is not that of The Gas Institute, but that of the District Associations. It looks more and more as if gas managers who have anything special to communicate to their fellows, choose the compactness, and we may even say friendliness, of a District Association meeting in preference to a looser, if larger, Assembly. Authors of papers who are not gas managers, and who regard their performances in this line in the light of advertisement, naturally prefer the largest public they can find. To the average gas manager, however, his District Association meeting appeals with much attraction. His good friend, the Honorary Secretary, is always so deeply obliged for the promise of a paper, that he likes to favour him whenever possible. Also, there are none but friends in such a meeting. Nobody seeks to make points at anybody else's expense. Moreover, the proceedings at a District Association meeting are reported just as fully as those of The Gas Institute, and go quite as far. Altogether, it must be admitted that if the District Associations rob The Gas Institute of papers, they will do the same for the Institution; and that the two general Societies will have to subsist largely on the contributions of authors who are not gas managers, or who are not liable to the seductions of local Association Secretaries. How the two organizations will compare in attractiveness to this order of authors, remains to be seen. We, however, sincerely trust, since there are to be two, that both will be fruitful of good for their members and for the gas industry at large.

The Last of a Bad Business.

It is well for the honour of British municipal life that such matters as those which occupied the Court of Appeal during the end of last week are not often brought before Her Majesty's Judges. For then the whole discreditable tale of the Lever and Hunter frauds, with their extraordinary complement—the agreement between Hunter and the Corporation of Salford—was told again for the last time (let us hope) in Lever's appeal against the judgment of the Queen's Bench Divisional Court, which refused to order a fresh trial of the action heard by Mr. Justice Day at Leeds. This was the trial which exploded all Lever's pretensions to the character of an Apostle of Purity, and cast him in heavy expenses besides. A great deal of fuss has been made about the bringing of this appeal; and it is only natural that such a person as Lever should exhaust every resource provided by legal forms for postponing the evil day when his disgrace could be talked of without reservation for an undetermined process of law. It is all finished now, however; and nobody need fear to speak his opinion of the line of conduct which, for utter meanness, can hardly be paralleled in the experience of this generation. We have no desire to occupy the space of the Journal with the blame of Lever; and therefore leave him, with the promise that only for very exceptional reasons shall his name ever more appear in our columns, and the hope that neither we nor our readers may be troubled with his like again. Mention is due, however, of the part played in this shameful drama by those who led the Corporation of Salford into that now notorious compact with their fraudulent servant which placed the whole Municipality on his level. It used to be asked in wonder what manner of place Salford could be to provide scope for such a career as that of Hunter. The question was solved by the appearance of that agreement, upon which the Master of the Rolls has been bestowing the choicest terms of a rhetoric peculiarly rich in expressions of opprobrium and contempt. Mr. Justice Vaughan Williams was pretty severe in the language he held with regard to this compact; and he took the trouble to deliver a separate judgment for the purpose of denouncing it. But Lord Esher surpassed himself, which is saying a great deal, in heaping contumely on this precious specimen of Salford Corporation ethics. No printed report, however accurate, can convey a proper sense of the spirit in which the Lords Justices of Appeal dealt with the whole business. The Counsel engaged, to do them justice, struggled gamely with hopeless material; but the Judges regarded the whole thing as a dirty business of which they were only too glad to rid their Court. We share the same opinion with regard to our own columns, and devoutly hope that this is indeed the last of it.

Water Gas Turned Out of Harrogate.

The notable Harrogate water-gas experiment has come to its end. We have always insisted, when glowing accounts of the beginnings of any new business have been published in the newspapers, that these notifications require to be supplemented by further information relating to the continuation and end of the affair in hand. In the nature of things, however, this is hardly to be expected. When a new experiment is to be launched under the public eye, a banquet to representatives of the Press will generally secure sympathetic notices of what is going on. If the venture proves a failure, there is nobody to stand treat to the reporters for the pleasure of announcing the fact; and so many a well-advertised speculation drops out of knowledge, and the technical student may, after few years, seek in vain for any reliable information concerning its end. Fortunately, we are in a better position with regard to the ill-fated Harrogate water-gas experiment. After a great deal of money has been wasted in the attempt to establish the utility of water gas for public lighting purposes in Harrogate, now, to the general relief, the water-gas people have confessed their failure, and, after narrowly escaping poisoning several persons, they are removing their plant from the neighbourhood which has been too long afflicted with it. The history of this remarkable incident in the modern history of Harrogate is worth telling. Although the Corporation had a contract with the local Gas Company for the street lighting of the town, they were persuaded to try water gas. The Company agreed to remain passive in the matter; and thereupon Harrogate was yielded up to a course of treatment which does not redound to the credit of those who sanctioned it. A water-gas making plant was erected in the Montpellier Grounds, which are one of the main attractions of the town; and the streets were torn up, in the middle of the season, for the purpose of giving what it was hoped would prove to be a splendid advertisement to the water-gas interest, with which certain local magnates were closely identified. The event, however, has turned out differently from what was anticipated. The water-gas lamps, which were of the magnesia comb variety, failed to justify their existence; while the gas itself was such a nuisance that an injunction against it was applied for by a local tradesman who found his business damaged thereby. It is certain, moreover, that financially the experiment has been a disastrous one for those who have had to pay the expenses. Taking the cost of the water gas at the producer at the lowest figure claimed by the promoters, and adding to this the expense of the combs, it is clear, having regard to the fact that about four times the quantity of gas is required for lighting in this way as compared with coal gas, that water gas can never compete with coal gas in the United Kingdom for purposes similar to those to which it was applied at Harrogate with such bad results otherwise. The whole thing has collapsed in a most melancholy fashion; and it says much for the attractions of Harrogate that it has not been ruined as a pleasure resort by the infatuation of the Corporation, who sacrificed everything in their frantic endeavour to exhibit water gas as a commercial and technical success. The conduct of the Harrogate Gas Company was throughout dignified and conciliatory.

A Mistaken Action.

An extraordinary bit of legal intelligence appears in its proper place in the present issue of the Journal; being a report of the proceedings before a Queen's Bench Divisional Court, composed of Justices Day and Lawrance, in the matter of the Mayor and Corporation of Manchester and Mr. Norbury Williams. The Corporation had brought an action for libel against Mr. Williams; and the proceedings in question were of the nature of a demurrer to a statement of claim. The defendant pleaded, first, that the libel with which he was charged was not a libel upon the Corporation; and, secondly, that a municipal corporation are unable to sue in such a matter. In the event, the Manchester Corporation must feel that they have been

badly advised in bringing their action. Their claim was dismissed by the Court in terms of contemptuous surprise, which ought to make those who have brought such scorn upon the Corporation feel very small indeed. Mr. Williams wrote a letter in a local newspaper, imputing the existence of bribery and corruption in the Manchester Corporation, and specially rubbing up the Victoria Hotel sore which already fretted that great body. The Corporation declared themselves insulted, and held up to ridicule and contempt, by their traducer; and they accordingly set their legal agents in motion to crush him. If the Corporation and their advisers forgot for the moment the familiar adage about such organizations having neither souls nor bodies capable of receiving appropriate chastisement, Mr. Williams was quite alive to this great truth; and he based his reply upon it in such a way as to procure the nearest approach to the kicking out of Court of his assailants that their incorporeality renders possible. Huge will be the laugh on his side against the ponderous Municipality that has treated him so clumsily. Local humorists may be trusted to make the most of the analogy between the case of the *Mayor and Corporation of the City of Manchester v. Williams* and the history of Jack and the Giant Blunderbore. After all, however, let us hope that the laugh will be allowed to die out at the proper time, and that this incident will not be made the occasion for the revival of old grievances which had better be forgotten.

The Collapse of the New Unionism.

The statement that the leaders of the Dockers' Union discourage the idea of a strike over the new arrangement that is to take effect at the London Docks to-day, is another indication of the weakness of what is called the New Unionism. We have already published so much about the principles and methods of this variety of Trades Unionism, that it is hardly necessary to do more at present than note how it waxes and wanes in different localities from week to week. Fortunately for the cause of civilization and of humanity, as we hold, the latter condition is more generally observable than the former. Notwithstanding all the vigorous drumming of the patrons and hangers-on of the New Unionism, it is as clear as daylight that the movement has lost its strength; and this is not matter for surprise, seeing with what little wisdom it has been managed. It has no real fight left in it, though it may still give trouble in isolated instances. It is like a Revolution that, having lost its pitched battles dwindles into a guerilla warfare that is powerless to alter the issue, but is capable of causing much purposeless suffering in dark corners. We notice that the Socialist leaders of the New Unionism have gone down to Leeds for the purpose of mutual congratulations in a locality which appears to have some sort of comfortable associations for them; but when they have been to Bristol they will have exhausted their available resorts for this purpose. Apart from all its other sources of weakness, as we have always held, the New Unionism was bound to fail, because it has been forced to depend upon lying, violence, and deceit in all that it has hitherto done. Sooner or later this was bound to prove its ruin. Labour, like all other causes, must obey the moral law and the law of the land, in order to gain its legitimate ends. We have never once denied that it had a case; and if it had been so presented as to gain the support of the rest of the community, it would have more speedily obtained general recognition. All experience of successful and permanent reforms demonstrates that particular causes can only triumph by dependence upon generally accepted principles, and not upon outraging them. Unfortunately for their dupes, the self-appointed leaders of the New Unionism took the latter course; and their supporters are now realizing the consequences. Revolutionary Socialists and Fenians have never been able to do any good for their own causes; and it was inconceivable that they could do more for the movement which they undertook to control.

Proposed Increase in the Rebate allowed by the West Middlesex Water Company.—The report of the Directors to be presented at the half-yearly meeting of the West Middlesex Water Company to-day contains a proposal that the rebate of 5 per cent. now allowed to the consumers shall be increased to 7½ per cent. from Christmas next.

WATER AND SANITARY AFFAIRS.

The Corporation are not to be so easily captured by the County Council as the latter may have thought. There is to be a conference between the County Purposes Committee of the Corporation and the Special Committee at Spring Gardens, upon the subject of the water supply "generally;" but the Corporation Committee are distinctly withheld, by the resolution of the Court of Common Council, from adopting in any way the direct suggestions contained in the letter from the County Council proposing the conference. This resolution was simply involved in the adoption of the report presented to the Court of Common Council by the County Purposes Committee. The Committee are therefore placed in the position which they themselves desired; and the restraint is virtually self-imposed. The "direct suggestions," it will be remembered, were that the Corporation should join the County Council in the promotion of a Bill for revising the water charges, and for giving power to the two bodies to establish an independent supply to the county of London. We suggested that in this proposal an attempt was being made to render the Corporation subservient to the ambitious designs of the new institution. The Corporation are moving warily, as they need to do. If we can define the separate policies of the two authorities, we should say that the County Council intend to bring forward a design for a competing supply, whether in pretence or in reality; while the Corporation would rather, in the first instance, have the Companies bought up, and the supply transferred to a new Water Authority, composed of representatives from all the jurisdictions concerned. It will be seen that our correspondent, Mr. E. K. Burstal, looks upon the representation of areas as likely to produce "an unwieldy and "unsatisfactory" body. But this might be prevented by a reasonable combination of some of the lesser powers. All the eighty Rural Sanitary Authorities would not each require a separate representative, and perhaps not all the forty-seven Urban Authorities. It must also be borne in mind that the task to be performed is by no means a light one. The water supply of all London and the contiguous country is a tremendous undertaking, and will tax the energies of a strong Board. But perhaps we are speculating about something which is yet a long way off.

There was a remarkable scene at the Court of Common Council last week, when the mode of conferring with the County Council in reference to the water supply was decided upon. A pertinacious minority sought—if we may use the term—to play into the hands of the County Council. The fierceness of the struggle showed that there was something more than ordinary at stake. The opposition to the recommendations of the Committee proceeded from a small party evidently anxious for the introduction of a new and competing water supply. These were outnumbered by at least seven to one; and we may conclude that the Corporation, as a body, intend to proceed on the lines laid down in the report which they adopted the other day. The policy of the County Council is a crooked one. They are seeking a conference with the Water Companies on the one hand, and with the Corporation on the other; professing all that is amiable and equitable towards the Companies, while asking the Corporation to help in getting power for an independent supply. A notice of motion is on the *agenda* of the County Council for to-day, proposing certain steps with a view to providing "an independent "and competing supply of water for the use of the Metro-"polis." It further appears, as we suggested last week, that the Vestries are going forward with their little Bill, which they hope the Government will take in hand; the object being to get the water supply, by one way or another, out of the hands of the Water Companies. Whatever is the fate of this diminutive effort, it is plain that the question is destined to come before Parliament at the instance of the Corporation. Concerning the County Council, there is a report that they will do all they can to bring in a Bill for a new supply. But if the Corporation will not be made a cat's-paw, we can scarcely see how the chestnuts are to be drawn. The report of Mr. A. R. Binnie, the Engineer to the County Council, is said to be ready, proposing to bring in a supply from the Upper Wye, the Severn, or from Dartmoor—the cost to range from £9,000,000 to £11,400,000. Our own belief is that Mr. Binnie is taking considerable trouble to little purpose. As for the proposed conference between the

County Council and the Water Companies, there is little prospect of the Companies accepting the invitation until the conditions are more clearly defined.

Pamphleteers are not likely to be idle during the present phase of the water question. Mr. Edward Monson, Assoc. M. Inst. C.E., a City Guardian, and M.M.A.B., has indited a *brochure* attacking the whole system of the Metropolitan Water Supply, but launching out more especially against the New River Company and the supply to the City. Sir Hugh Myddelton presents a sorry figure in the pages of this pamphlet. All he did was to cut "a little "bit of a ditch," leading from Amwell and Chadwell to "the old ducking-pond at Islington." When he had done this, Sir Hugh had no power to distribute his supply, except by means of water-carriers; and the New River Company, who purchased the undertaking, had to make the best terms they could with the adjoining owners, in order to carry their pipes across the intervening ground so as to reach the highways. All this story (although there is another side to it) helps to make it appear that the New River Company had a very small beginning and limited powers. But it is a long way back to 1613, or 1619; and it seems that Sir Hugh Myddelton's contemporaries had a very different idea respecting his work from that which occupies the mind of Mr. Monson, whose purpose is to do all he can to depreciate the water supply of the Metropolis. If the beginning of the New River enterprise was thus small, Mr. Monson is unable to deny its present greatness; and this, indeed, is his real grievance. The affair has prospered beyond all reasonable limits, according to his notion of what is right and proper. The profits are enormous; and he wants to know what becomes of all the money. If this gentleman will condescend to look into the accounts, he can see for himself. Perhaps he cannot do better than turn to the pages of Mr. Lass's "Analysis." He will there see that the net profits of the New River Company last year amounted to £245,000, representing 12·11 per cent. on the stock and share capital; and that £241,000 was paid away in dividends. The profits were large; but they are not undiscoverable, neither were they always so great as they are now. Mr. Monson complains about the increased charge arising out of the quinquennial assessment of property. But Parliament has seen fit to specify rateable value as the basis of the water charge; and the Companies have nothing to do with raising the assessment. Taking the Companies all round, the net profit per annum is not much over 9 per cent.; and this can hardly be called an extravagant return, considering all the risk, and the bad years in the past. "Water," says Mr. Monson, "is "common property." And so it is; but pumps and pipes are not. To supply above 31 million gallons per day to a population of 1,148,000, distributed over an area exceeding 90 square miles, is a work demanding both capital and skill; and the idea of "common property" has no practical bearing on the question. Having pronounced the present system all over London as "decidedly bad—"bad in the extreme," Mr. Monson casts about for a new scheme. "The City," he says, "is by no means helpless "in this matter. Only let the Corporation fully resolve "to have a fresh supply, and the thing is done." Let us see how it is "done." There is the well which the Commissioners of Sewers are sinking. "What I have to say "of that is," so writes Mr. Monson, "that I am ashamed "of the affair." Our engineers have done wonders; and the Corporation are constructing the Tower Bridge. "Is "it to be said," inquires our pamphleteer, "that to dig a "trumpery well is a work too great for us?" Mr. Monson must remember that it is one thing to dig, and quite another thing to find water. At the conclusion of his pamphlet, the writer explains that he has derived many of his historical facts concerning the New River Company from Smiles's "Lives of the Engineers;" and he then says concerning Mr. Smiles: "Although I have stated the facts "as given by him, I have arrived at very different con-"clusions." We should suppose so. Among other things, Mr. Monson attacks the purity of the New River supply, in defiance of the abounding evidence in its favour. On the present occasion, we are content to refer this rampant writer to the letter by Major Lamorock Flower, which appears to-day in our "Correspondence" columns. Probably Mr. Monson will differ from Major Flower as well as from Mr. Smiles. But the public—certainly those who are able to judge—may be expected to differ from Mr. Monson.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 966.)

ANOTHER week of terrible anxiety and uncertainty has passed; and the second of the two October settlements (which will long be remembered in financial circles) has been "got through." This expression is scarcely correct if it be taken to mean "completed and ended;" for there must be many accounts only temporarily arranged, and many awkward difficulties only tided over. In fact, strong pressure had to be brought to bear in some quarters to give the utmost possible accommodation, in order to prevent an array of disasters which might produce a tremendous and wide-spread crash. Happily the worst is over, we believe; but progress to financial convalescence will probably be but slow. Prices generally are now as low as one would expect it practically possible for them to be; and there is a fine field of investment open to any one who will buy with prudence and judgment. The Gas Market has been very little affected; and indeed it has not been at all disposed to be flat, if we except the very slight lowering of 1 in the quotation of Gaslight "A." But even in that case, the closing prices at which business was done on Friday were as good as any in the week. (Saturday, being the 1st of November, was a close holiday.) A fair proportion of business, though not in itself extensive, was done in the secured issues; and the prices obtained were about the average. South Metropolitans have been very lightly handled; a couple of transactions in "B" being all that was done. The quotation, however, is 1 higher. Commercial old, after a period of quiescence, has moved at last. The quotation advanced 2; and the best price marked was 251¾. The Suburban and Provincial companies present no feature of interest; and nothing was done in them but a little business in Brentford and in British. Of the Foreign companies, San Paulo is conspicuous, with a further advance of ½; and Bahia and Monte Video have realized good prices. The Continental group have had quite their fair share of activity—especially Imperial Continental, which, in spite of somewhat wide margins, seems inclined to go a bit higher. The rest call for no special remark. Small business has been done in Water; but the only variation has been a rise of 1 in Chelsea.

The daily operations were: Quiet business in Gas on Monday, though almost every issue commanded good value. South Metropolitan "B" improved 1. On Tuesday, the prices obtainable were not quite so good; but still no quotation receded. On the contrary, Commercial old improved 2; and San Paulo, ½. In the Water department, Chelsea advanced 1. Wednesday's transactions were very restricted, both in Gas and in Water; and quotations did not vary. There was a shade more animation on Thursday; but the figures marked presented no indication of any tendency either way. On Friday (the last working day of the Stock Exchange week), the quotation of Gaslight "A" was lowered 1. Other issues, however, kept well up; and quotations closed without further alteration.

ELECTRIC LIGHTING MEMORANDA.

The Affairs of the Metropolitan Electric Supply Company—Something Wrong about the Chelsea Company—The Duty of Electric Lamps.

THE attention of readers of the London newspapers has been drawn to the affairs of the Metropolitan Electric Supply Company by the publication of the Directors' interim report, which explains that henceforward the accounts of this, as of all other statutory electrical supply companies, will be made up to Dec. 31. In the case of this particular Company, this means that the next accounts will cover 15 months' working, and will be presented to the shareholders, at a general meeting to be held early next year. Advantage is taken of the issue of this notification to advertise the position and capabilities of the concern. It is declared that the Company are making steady and substantial progress with their works; and they further claim to be building up what promises to be a large and remunerative business. During the 14 months that have elapsed since the Company obtained statutory powers, they report having laid upwards of 40 miles of street mains in their district. Current is being supplied from four central stations, situated in Whitehall, Sardinia Street, Rathbone Place, and Manchester Square. Of these, the first two are stated to be completed, while the two others are nearly so. Seeing that the Company did not construct, but merely took over the Whitehall Station from another Company—paying very dearly for it, by the way—they have only, by their own showing, completed one station. The Directors hold out hopes of being able to recommend a dividend for next year; but this promise partakes too much of the character of electricians' prophecy to be received with much respect.

An interesting account has been published in the *Engineer* of the station and system of the Chelsea Electricity Supply Company, whose head-quarters are in Draycott Place, close to the Sloane Square station of the Metropolitan Railway. This is the Company which makes great use of accumulators in the distributing system. The amount of business done up to last month is given as equivalent to the supply of 17,300 lamps of nominal 8-candle power. The current supplied is low-tension; the

district being subdivided into equal storeage areas of 415 yards square. The system of distribution apparently necessitates a good deal of testing and regulating apparatus of an elaborate and costly character. The central station is a handsome and well-equipped structure, combining works, stores, offices, &c., under one roof. The boiler-house contains four 120-horse power water-tube boilers, but only two of these are at present in use. The engine-room is a very neat-looking place, with its row of combined engines and dynamos; but no particulars are vouchsafed of the quantity of power generated and actually utilized. This is regretable, as the figures given seem to require some explanation. The amount of lighting said to be done is equivalent to 17,300 × 8 = 138,400 candles. Now, supposing that (taking account of the loss by storeage) the light of about 100 candles is afforded for every horse-power developed by the steam machinery, we should require 1384-horse power to do the stated work. It is reported, however, that only two boilers, giving nominally 240-horse power, suffice for the purpose. There is such a discrepancy here, that fuller particulars are imperatively called for. At present it would seem that either the Chelsea Company have deceived the reporter for the *Engineer*, or the latter has deluded his readers.

The subject of the actual, as compared with the nominal candle power of electric lamps of both kinds has been recently discussed on the basis supplied by an American electrician; but further valuable information on the same head has been communicated by Mr. S. T. Dobson to the *Electrical Review*. Mr. Dobson, who refers to the Vienna electric lighting experiment of the Imperial Continental Gas Association, begins his statement by remarking that most engineers take account of the exaggerations of electricians in regard to the illuminating power of their arc lamps, and "allow somewhere about 600 effective candle power for an arc of 2000 nominal candle power." This is, of course, true of engineers; but what can be thought of the honesty of those electricians who, like the Brush people, persist in using this "nominal" rating for their lamps, with intent to deceive in computations of the amount of light afforded by such lamps and by ordinary gas-lamps respectively? The public are misled in this way, if engineers are not. As to incandescent lamps, Mr. Dobson states that, having to renew 25,000 burnt-out lamps yearly, it was of the greatest importance to his Company to choose the best. Five different makes were experimented with, at a constant pressure of 100 volts; and their illuminating power and consumption of energy were noted for different periods. The best were the Edison-Swan Company's lamps, which at the end of the first 100 hours gave a light of 18·8 candles for 3·45 watts per candle. From this the fall in duty rendered was continuous, until after 900 hours the lamps gave only 12·4-candle power with a consumption of 4·9 watts per candle. The average of the Edison-Swan Company's lamps may therefore be taken as nearly 16-candle power for 1000 hours, with a consumption of 4¼ watts per candle. The fact of the matter is, Mr. Dobson says, that the present 16-candle lamp is the old 20-candle power nominal. It may be worth remarking that these data throw a much-needed light upon certain of the claims of electricians. As a horse-power is equal to 746 watts, it follows that by dividing 746 by 4¼ we have the number of candles an electrical horse power is capable of giving in Edison-Swan lamps of the best construction. This is rather more than 175—let us say, for charity's sake, 176. It will be well to bear this figure in mind when the statements of electricians concerning the amount of business they do from their central stations have to be criticized. Mr. Dobson declares that his figures are absolutely reliable, because of the care with which the experiments of the Company were made, and the splendid instruments available for testing purposes at the Vienna station. All the same, we do not expect to see them largely quoted by electricians. If we did not provide a home for reliable information of this kind from all sources, it would soon be buried out of sight.

Mr. C. Y. Bennett, Engineer and Manager of the City of Wells Gaslight Company, has recently been appointed Manager of the Wells Water Company.

The Incorporated Institution of Gas Engineers.—The Board of Trade having sanctioned the application of the above-named Institution, as well as that of The Gas Institute, for a Licence under the Companies' Act, 1867, as stated in our editorial columns to-day, the former body has been registered as a limited liability undertaking, "to promote the advancement of the gas industry in all or any of its branches." For the purpose of registration, it is stipulated that the number of members is not to exceed 1000.

Mr. B. Scott, a member of the Gas Committee of the Carlisle Corporation, has been invited to accept the office of Mayor for the ensuing year; and he has expressed his willingness to do so, provided it is the unanimous wish of the Council. In view of the meeting of The Gas Institute in the city next June, under the presidency of Mr. J. Hepworth, Assoc. M. Inst. C.E., the Gas and Water Engineer of the Corporation, the nomination of Mr. Scott for the mayoralty is a specially happy event; and there is little doubt the reception the members will meet with at his hands will not lack any of the cordiality to which they have been accustomed when visiting the provinces.

A TOPIC OF THE DAY.

In last week's JOURNAL notice was taken, not unfavourably, of the method of dealing with papers adopted by the American Society of Mechanical Engineers. It may be as well to repeat that the essential principle of this method consists in previously distributing prints of papers to be submitted to discussion at a meeting of the Society, so that actually the authors of the papers are not required to read their compositions in full, but only to give their conclusions in abstract, in order to start the discussion. It is clear that a good deal may be said for and against this arrangement; but we are not sure that the balance of argument would not be in its favour, provided the subjects of papers so treated are of sufficient debateable interest. For it is obvious that unless a paper to be read at a meeting of a technical society is worth debating, it would simply destroy any little interest of another kind that might belong to it to treat it in the contemplated fashion. There are papers which are distinctly worth reading to, and printing in the transactions of a technical society, which are yet not debateable. Some of these compositions partake so much of the character of lectures, in that they are the pronouncements of men who have made the particular subject their own, so that what they have to say upon it is not exactly discussable, except on the presumption that their hearers are as expert as themselves, which is not possible. It would be a mistake to require a paper of this kind to be read in the form of an abstract, because the author can usually make his meaning plainer by reading his explanations at length; and anything that is still cloudy can be cleared up by a pertinent question afterwards. Taking the general run of papers, however, in which an author describes some process or endeavours to enforce some conclusion as to which his hearers are fully as competent to form an opinion as himself, it certainly appears that time would be saved for an interesting discussion if the main points could be thrown down, as it were, for debate in the midst of an interested meeting previously primed for the task.

Moreover, this procedure would be very suitable for dealing with papers which in the ordinary way almost announce their contents by their title. It often happens that as soon as the title of a paper is published, the interest of prospective hearers is engaged, and they can form a tolerably correct idea of the contribution they may be able to make to the discussion, or of the inquiries they may hope to satisfy through the paper itself or by questioning the author. It so happens that the very first meeting of a District Associations of Gas Managers announced after this question of the advantage of the prior publication of papers had come under our notice is that of the Southern District, which is fixed for the 13th inst. Two papers are promised for this occasion, the titles of which may be looked at in the light of our preceding remarks on the general subject. The first in order is a paper by Mr. Frank Livesey on "A Ready Means of Enriching Gas;" and the second is by Mr. H. Smythe, of Maidstone, on "Gas Distribution." Now, the first paper is eminently one to which the observations at the beginning of this paragraph may be said to apply. Every gas manager knows what is meant by enriching gas, and has experience of at least one method of doing it. He is therefore prepared to discuss such a paper without further knowledge of its character than is afforded by the title. But at the same time it would perhaps be as well that those who contemplate joining in the debate upon such a paper should be warned of its general drift. With regard to Mr. Smythe's communication also, such a title as he has chosen may cover half-a-dozen different lines of argument, yet nobody outside the Council of the Association will be able to know, until the paper is read, what views the author has taken, and what facts should have been collected to corroborate or refute him. For reasons such as these we hope that the governing bodies of District Associations of Gas Managers will take an early opportunity of discussing this suggestion. It is not the only one that we have laid before the District Associations. We hold that these Associations have now before them a greater field of usefulness than ever; and in common with the best friends of the gas industry, we wish them all prosperity, one undeniable evidence of which will be bulky transactions filled with sound technical matter.

Let us, by way of testing the matter, assume that an experiment has been sanctioned by the Council of the Southern District Association, and that Mr. Livesey's paper, by way of example, has been sent to the members before the day of the meeting. There can be no doubt, to begin with, that any paper on this subject, coming from a practical gas manager, would attract attention just now. For the first time for many years the allegiance of gas managers to cannel coal as the staple enricher has been shaken in many places. In all probability, a respectable number of members of the Southern Association have during the past few months experimented with mineral oils and spirits, in company with, or in substitution for cannel, in their ordinary working. Cannel has been scarce and dear; and petroleum has been ready to hand. If these gentlemen will only take the trouble to make notes of their experiences, and bring them up on the 13th, the meeting of the Southern Association can hardly fail to be exceptionally interesting and instructive, whatever may be the character of Mr. Livesey's communication. It is generally known, however, that the South Metropolitan Company have lately carried out extensive experiments in carburetting gas by petroleum spirit. Mr. Frank Clark is the

modern prophet of gasoline in gas manufacture, as we have shown in the several notices that have appeared in these columns respecting his work in this line for The Gaslight and Coke and other companies. The coming meeting will be a field-day for the gasoline party, because it is tolerably certain that Mr. Livesey will give his opinion regarding its use on the large scale, not only by Mr. Clark's—or rather by the Maxim—system, but also by other means. In the competition between cannel and petroleum, a good deal will naturally hang on Mr. Livesey's paper and the discussion of it, which ought, therefore, to be as ample and weighty as it can possibly be made by preparation.

It may perhaps be of assistance in elucidating a matter which is indubitably of great importance to all gas managers who have to make from Newcastle coal 16, or even 15 candle gas as tested by the official examiners at a distance from the works, if we state a few of the points upon which reliable information relating to the employment of a petroleum enricher is much to be desired. In the first place, there is the question as to the comparative value of petroleum carbonized with the charge in the retort, and of gasoline added to the gas after it is purified and on the point of leaving the works for the district where it is to be consumed. The cost of improving the illuminating power of gas by one candle is likely to be much more uniform when any form of petroleum is employed as the enricher than when cannel coal is used; and precise figures relating to the former point will be welcomed. The effect of petroleum vapour in gas upon naphthalene deposits ought also to receive mention. As to the carrying power of gas for gasoline vapour, we are not now afraid to hold that this has been completely established within the limits of use of the enricher by English gas companies. Gasoline is as permanent in its effects as cannel itself up to at least 25-candle gas; and for richer gas not even cannel can be trusted to carry to any great distance in winter, as Scotch gas managers know perfectly well. Of course, there is no patent in the use of gasoline vapour for enriching gas. Anybody can try it in his own fashion; but, in this as in most other things, it is best to take advice from experienced persons. Finally, it may be confidently stated that, if the price suits, there is no reason why the use of cannel coal should not be abandoned to-morrow in southern gas-works in favour of petroleum spirit. The idea is not likely to be pleasing to cannel coal merchants; but it is hardly to be wondered at if gas manufacturers of the South of England care little for the convenience of these gentlemen, because it is a curious and unpleasant fact that, whenever there is anything the matter with the coal market, the cannel trade seems to become disorganized the first thing. Perhaps it is because the available cannel-fields are so restricted that, like a thermometer with a small bore, a slight alteration of the external conditions makes a great difference to them. At any rate, English gas makers entertain the conviction that the cannel people have had a power over them which they have unmercifully exercised; and it will be regarded as a very good thing if the result of Thursday week's discussion is to show that the Southern gas manager has at command more than one means of bringing up his gas to the point required by the official examiner.

Southern District Association of Gas Engineers and Managers.—The next meeting of this Association will take place at the Holborn Restaurant on the 13th inst., under the presidency of Mr. T. May, jun., Assoc. M. Inst. C.E., of Richmond. As usual at the November meeting, the business will include the election of office-bearers for the ensuing year. Two papers will be presented—one by Mr. F. Livesey on the subject of enriching gas; and the other by Mr. H. Smythe, of Maidstone, on gas distribution. These are both topics on which, as pointed out in an article which appears elsewhere, instructive discussions may be based; and it is to be hoped the members will freely express their views thereon. At the close of the proceedings, tea will be served. It will be noticed that the Association have moved from the Hôtel Métropole to the more central establishment in Holborn.

The Price of Gas in Brussels.—In the JOURNAL a fortnight ago, reference was made to the movement set on foot by the coffee and refreshment house keepers of Brussels to obtain a reduction in the price of gas. It may possibly be remembered that this was a test question at the municipal elections. We learn from a correspondent in the city that, although the elections are barely over, the agitation has already had an important result. The Gas Committee of the Corporation have, in the first place, decided to lend out gas heating-stoves to all classes of consumers, instead of confining them, as now, to the occupants of houses belonging to the City. Up to the present time, the general public have only been able to have on loan gas hot-plates and cooking-stoves. With regard to the charge for gas, it has been determined to bring it down to a uniform figure, regardless of the use to which the gas is put. Our readers may remember that for some time past two prices have been charged in Brussels—15c. per cubic metre for night, and 10c. per cubic metre for day gas (3s. 4½d. and 2s. 3d. per 1000 cubic feet respectively). The new figure has not yet been settled; but we understand that the Committee rather favour the intermediate one of 12c.

NOTES.

Testing Mains Before Coating.

There has been a discussion upon cast-iron coated pipes before the American Institute of Mining Engineers and the American Water-Works Association; and this has elicited from Mr. James C. Bayles, a pipe-founder, a written communication relative to the coating of pipes by a tar composition. Mr. Bayles recommends that in all pipe specifications a demand should be made for the testing of the pipe before it is coated. This is particularly required for cast-iron pipe. Any form of coating (Mr. Bayles says) which is suitable for a pipe that has to be shipped and handled, is capable of concealing a multitude of small defects in casting, such as blow and sand holes, and even small shrinkage cracks. In 1887 the Health Commissioners of New York found it necessary to amend their plumbing code by the insertion of a clause forbidding the use of dipped, varnished, or painted pipes. The reason for this action was the discovery that even a thin coating, of very little value as a protection for the iron, could be made to conceal so many foundry defects, and permitted so much carelessness on the part of the makers, that sound pipes were the exception rather than the rule. The value of such a coating in enabling pipes to pass a test is shown in much of the light riveted pipe in the market. A pipe put together with small cold rivets, pressed by a machine, after coating with tar and asphalte, will often withstand a pressure that, but for the coating, would make the seam show a continuous leak from end to end. For the testing of pipes that are to be put together with caulked lead joints, it is not unusual, says Mr. Bayles, to find test pressures specified far in excess of anything that the joints could possibly stand. Such joints will not carry a great pressure; and, as a matter of fact, they are not unfrequently blown out in water-works practice, under pressures far below what the pipes could carry safely and comfortably. The useful strength of a pipe cannot exceed the strength of its joints; and Mr. Bayles holds that a lower test than that generally imposed would be a sufficient guarantee, provided it was applied before the pipes are coated. Mr. Bayles's idea of a proper test is a hydrostatic pressure of about 250 lbs. per square inch for 6 and 8 inch pipes, reducing by degrees to 125 lbs. for 36-inch ones.

Coal-Conveying Plant.

Particulars were recently published in the *Engineer* of an extensive arrangement of coal-handling machinery fitted by the New Conveyor Company to a range of boilers at the Nunnery Colliery, Sheffield. It is remarked that although mechanical and automatic stoking for steam-boiler furnaces is growing in favour, inasmuch as it saves fuel and lessens smoke, appliances of this order do not of themselves lighten labour, because it is really easier for the firemen to throw the coal into the furnaces direct than to fill the hoppers of self-acting stokers, when this work has to be done by hand. It follows, therefore, that no boiler-stoking machinery is complete without some mechanical means for the elevation of the coal and the filling of the hoppers; and the same may be said of the improved automatic retort-stoking apparatus now in the market. Essentially, the device employed by the New Conveyor Company at the Nunnery Colliery is the same in principle as other elevating plant. The coal is tipped from waggons on the floor-level into a pit, in which the elevator is placed. The elevator is not "drowned," as it were, in the material to be lifted, as in the earlier forms of this appliance, which caused great friction in working. The coal is fed into the elevator buckets by means of a hopper, from which it slides into the buckets as these present themselves opposite the outlet port. This free working of the elevator is found to be a great advantage. When required, the storeage hopper may be of considerable length and capacity, and in the bottom of it is then placed a spiral conveyor, which moves all the contents to the outlet, where the elevator works. At the Nunnery Colliery, the conveyors fill the hoppers, and carry off the ashes by the return; so that the plant is practically labourless.

A New System of Testing Cement.

Professor T. Hudson Beare, of the Liverpool University College, has contributed to the *Builder* an account of some experiments with Mr. Arnold's method of gauging cement for testing, the object of which is to eliminate some of the errors incidental to the ordinary method of gauging test briquettes by hand. In this new system the moulds are of the ordinary form and cross section; but for briquettes, which when finished are to measure an inch in thickness, they are two inches deep. The moulds are placed on a stout, flat tray, with a shallow rim all round it, and are then filled with dry cement; a measured quantity (0·3 lb.) being placed in each. A brass die of the exact shape and size of a finished briquette is then placed on top of the cement in each mould, compressing the contents. This compression is completed under a small hand screw press, which so compacts the dry powder that it only occupies half the mould; the die being then flush with the top of the mould. The result of this part of the process is the formation of an exceedingly closely compacted briquette of dry cement exactly an inch thick. Water is then poured into the tray, and is taken up by the briquettes by capillary attraction, which goes on for 20 minutes. The moulds are removed from the tray and placed on a table, die downwards, to set for

24 hours. The after-procedure is precisely the same as with ordinary cement testing. At the end of the 24 hours the briquettes are removed from the moulds and placed in water, where they remain for their appointed time before being broken. Professor Beare found all the briquettes exceedingly compact and close-grained. Owing to the quantity of cement in each being about 15 per cent. in excess of that in ordinary test pieces, the strength was uniformly higher. It was shown, however, that the tests possessed remarkable uniformity—much more, indeed, than a clever manipulator could be expected to obtain by hand gauging. If, therefore, some such system were adopted, Professor Beare thinks one element of uncertainty, due to the personality of the gauger, might be eliminated.

Death of Mr. J. W. Wells, of Cape Town.—We regret to record the death of Mr. James Wesley Wells, one of the Directors of the Cape Town Gas Company. The deceased gentleman took up his abode in Cape Town in 1865, and was regarded as one of the best business men and financiers in the Colony.

Denver (Col.) Water-Works.—Two enormous earth dams are to be built by the Citizens' Water Company, of Denver (Col.)—an undertaking organized in 1888 to furnish a public water supply to that city by gravitation. The dams are to be located in the mountains, 17 miles south-west of Denver and two miles west of Wheatland. They will impound 9500 million gallons of water—the upper one, 6000 million gallons over an area of 323 acres, at an elevation of 835 feet above the city datum; and the lower one, 3500 million gallons over 150 acres, at an elevation of 735 feet. The lower dam, it is said, will contain 1,750,000 cubic yards of material, against 2,050,000 cubic yards in the upper dam. The inner dam will be 275 feet high, 680 feet long on top, but 20 feet long on the bottom, and 1200 feet through at the widest part at the base. The area of the base, it is said, will be 18 acres. It will be of earth, puddled and rolled in 6-inch to 12-inch layers, with an inner slope of 2½ to 1, and an outer of 1½ to 1. Both slopes will be heavily paved, and will be terraced 10 feet horizontally to 30 feet vertically. The inner slopes, at least, will have a 2-inch coating of asphalte over the pavement.

American Gaslight Association.—We learn from the last number of the *American Gaslight Journal* that the above-named Association had a very enjoyable meeting at Savannah on the 16th, 17th, and 18th ult., under the presidency of Mr. Emerson M'Millin. It is true that the attendance on the opening day was less numerous than might have been wished; but 150 members handed in their cards, and 35 accessions to the roll were recorded. Five papers were read on the first day, and elicited interesting and instructive discussions. Mr. John P. Harbison was elected President for the ensuing year; Mr. C. J. Russell Humphreys retaining his position as Secretary. Next year's meeting will be held in New York. The members had a very cordial reception in the Southern city; in fact, to use the words of our contemporary's correspondent on the spot, the gathering was "one round of pleasure." An important decision has been come to with respect to invitations; the Association having determined (again quoting the above-mentioned authority) "to accept no more banquets, but hereafter to feed itself." The meeting is said to have been in all respects flawless; its technical lessons being important, and its social side perfect. We hope in an early number to commence our usual abstract of the "Official Report" of the proceedings, which will appear in our contemporary's pages.

Electric Lighting in Belgium.—In a paragraph in the JOURNAL for the 21st ult., on the gas question in Brussels, reference was made to the electric lighting project of the Municipality. The offers invited by them for carrying out an installation in the city have been sent in; but it seems to be very doubtful whether, after all, any outsiders will be entrusted with carrying out the project—it being far more probable that the Municipality will themselves put up a station, and work it as they do the gas undertaking. In such an event, the question might very properly be asked why there should have been all the formality of inviting offers and adjudicating thereon. The only reason would appear to be a desire to satisfy public opinion and gain time. We learn from a Brussels correspondent that the town of Ninove has lately relinquished gas in favour of electric lighting—not merely by way of experiment, but definitely; having entered into a contract for 30 years with the Société Bruxelloise for both public and private lighting. The station is capable of serving 1000 incandescent lamps of 16-candle power; and the electricity is distributed by means of overhead wires. There are 120 public lamps, each of 25-candle power, surmounted by enamelled iron reflectors. As these lamps are fixed above the original gas-lamps, the appearance is not very elegant; and, moreover, the light is interfered with. The price to be paid for the new illuminant will be the same as that charged for gas—about 4s. 6d. per 1000 cubic feet. The private consumers will pay at the rate of 9d. per 1000 watt-hours. Out of the 7000 population, 2000 are workpeople. The Gas Company's concession expired on the 30th ult.; and the new system was inaugurated, with festivities, on the 5th inst. The adoption of electric lighting by this comparatively insignificant town is not a very important matter to record in these columns; but a certain amount of interest nevertheless attaches to it, from the fact that it was the first place in Belgium to employ gas lighting.

COMMUNICATED ARTICLE.

THE GADD AND MASON GASHOLDER.

A REJOINDER TO MR. W. GADD'S "REVIEW OF A CRITICISM."

By F. S. Cripps, Assoc. M. Inst. C.E.

I.

In the JOURNAL OF GAS LIGHTING for Sept. 16 and Oct. 7 last there appeared two articles entitled "A Review of a Criticism," by Mr. W. Gadd. The criticism referred to was written by the present writer, for the purpose of pointing out the numerous errors contained in a paper read before The Gas Institute by Mr. Gadd, styled "The Principles involved in the Construction of the Northwich Gasholder." The paper may be seen in the JOURNAL for July 8, and the "Criticism" in the number for July 15 of this year.

As this so-called "Review" may prove a stumbling-block to students of gasholder construction, and those just commencing the study of mechanics, it may be desirable to expose the fallacies therein advanced; and this perhaps is the more excusable on account of the subtle and confident manner in which the errors have been set forth. In reading this "Rejoinder," it is particularly desirable that the "Review" should be read side by side with it. Not only in fairness to the author of the review is this necessary, but also the better to understand the points under discussion.

The "Review" deals throughout with but *three* points of the present writer's "Criticism"—viz., (1) that referring to the resolved vertical forces acting on the tank guides, induced by the action of the wind upon the gasholder sides; (2) the use of the signs + and − in respect to the posts; and (3) the location of the *neutral axis*. Practically, the whole of the "Review," however, is occupied in defending the erroneous method the reviewer adopted in his original paper in respect to the first-mentioned point. If it may be so expressed, the reviewer "puts all his eggs into one basket," and seems to say: "I pledge my faith to my manner of dealing with *this* point; and if I am defeated over this, I will accept defeat all round, and *vice versâ*." The words are (see fourth paragraph of "Review"):

"The critic makes a clean-cut assertion, subsequently repeated in the correspondence, admitting of no prevarication whatever, that the author had only taken the *vertical* force of *one side* of the holder, and divided this amongst the whole of the eight rollers. It must be admitted by all, including the critic, that this is the central idea of the criticism, which, if it be not true, must break down the whole of the elaborate fabric raised around it. Is it true? We will see."

[*Note.*—It must not be imagined that the writer's criticism only referred to these two or three points. By far the largest portion of the "Criticism" is passed over by the reviewer without the slightest attempt to justify the position he assumed. True, he designates the refutation of his errors and misleading ideas as "padding;" but there is every excuse for such a characteristic defence, as one untrained in practical gasholder construction cannot be expected to realize the objections which to practical men are all-important and convincing.]

Perhaps, before proceeding further, it would be as well to refer to the original paper ("The Principles involved in the Construction of the Northwich Gasholder") and see what the writer of the "Review" really did do. It will be found on p. 79 of the present volume of the JOURNAL. It will there be seen that, after stating that the "equivalent of all the wind force applied at A" in the diagram (here repeated to smaller scale)

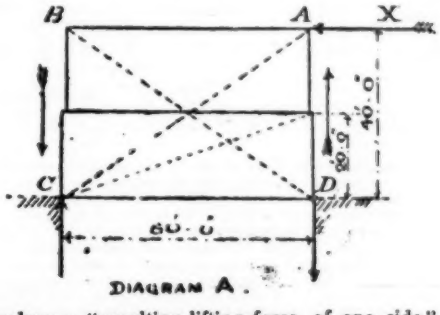


DIAGRAM A.

will produce a "resulting lifting force of one side" equal to "the depressing force of the other," the article proceeded as follows:—

"To get at the value of these forces, if such a structure is subjected to a gale of 50 lbs. to the square foot, is a comparatively simple process. For brevity's sake, we will take the holder to be elevated, and to measure 60 feet by 40 feet uniformly from top to bottom, and consider the whole height as exposed to wind pressure. This is in excess; but the error is on the safe side.

Now $\frac{60 \times 40}{2}$ = 1200 square feet = the equivalent plane area of exposed surface.

1200 × 50 = 60,000 lbs. total distributed wind pressure exerted on the holder. This is equivalent to 30,000 lbs. exerted at a point (E) 20 feet high. Then $\frac{30{,}000 \times 20}{60}$ = 10,000 lbs. of total vertical force which, if distributed equally through the points represented by the eight rails = 10,000 ÷ 8 = 1250 lbs. = the simple vertical force on each rail acting in contrary directions on opposing sides."

In the "Criticism," this remarkable passage was dealt with thus—

"As to the effect of wind pressure. 60,000 lbs. uniformly distributed over the entire height of a 40 feet high cantilever is not the same as 30,000 lbs. applied at a point 20 feet high. If half the load is taken, it must be applied at the *extremity* of the cantilever to have the same effect as the whole load distributed. This amount must therefore be *doubled*. The vertical force then is 20,000 lbs., not 10,000 lbs., on each side, at points the extreme diameter apart. Then Mr. Gadd distributes this equally on eight points of support. This is wrong—first, because four of the points are on one side of the neutral axis and four on the other, so that each group of *four* would have 20,000 lbs. between them; and, secondly, because it assumes that all the points are at the same extreme distance from the neutral axis, whereas only one, at the best, can be at the extreme distance, the others approaching much nearer the axis, and therefore offering but little resistance (see figs. 1 and 2).

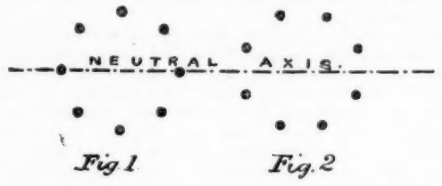


Fig 1 *Fig. 2*

Surely Mr. Gadd knows that *the pressure on the various points depends on their respective distances from the neutral axis of the system;* and his gas-holder cannot get away from this law or principle in mechanics. Even assuming the three points on either side of the neutral axis in fig. 1 to take each an equal share of the load (those *on* the neutral axis are, of course, practically useless when in that position), they would each be subject to a direct 'vertical force on each rail, acting in contrary directions on opposing sides,' of 6666 lbs.—a very different thing from 1250 lbs., as stated by Mr. Gadd."

The reviewer's defence in the correspondence which followed was that he had confused the wind pressure per square foot in some way; and that whereas the forces given by him as acting on the tank guides were, by confusion of figures, apparently due to a 50-lb. wind-pressure, they were in reality *intended* as the effect of a 25-lb. wind pressure. It has already been pointed out how utterly inadequate such an explanation was to meet the case, as, making every allowance for this mishap, it still left the strains considerably *under-stated*.*

The reviewer, seeing that his defence was an inadequate one, thereupon writes the "Review of a Criticism," to which, after calling to mind a few of the well-known principles or laws of mechanics, we will give close attention. For the proof of the following principles of mechanics, references can be given to the highest authorities, if necessary:—

I.—Any force acting in a plane may be considered as acting at *any* point in its *line of direction*. This is called the principle of the *transmissibility of force.*

II.—The *moment* of a force about any point is equal to the magnitude of the force multiplied by the perpendicular distance (or shortest distance) of the point from the *line of direction* of the said force, *and is altogether independent of the point of application of the force to the body on which it acts.*

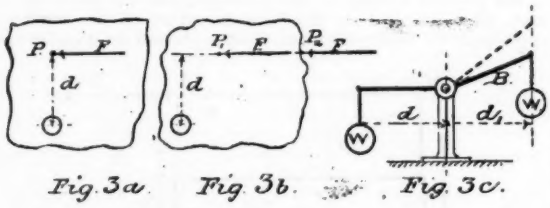


Fig. 3a *Fig. 3b* *Fig. 3c.*

To illustrate this, let F (in fig 3a) be the given force, represented in direction by the arrow; the point of application being at P. The *moment* of the force around a point O whose perpendicular distance from F is *d* is obviously $F \times d$. But the *point of application* of the force may be at P_1 or P_2 (see fig. 3*b*)—the turning moment of the force will be precisely the same as long as the perpendicular *d* is the same in length. This principle receives practical effect in what are known as bent levers. In fig. 3*c* the two equal weights balance one another, if *d* and d_1 are equal. It does not matter what angle they make with one another. (See Trautwine for numerous simple illustrations of this principle.)

III.—If any body acted upon by parallel forces be in equilibrium, the algebraical sum of the forces must be *zero;* or, in other words, the sum of all those acting in one direction must equal those acting in the opposite direction.

IV.—If any body acted upon by forces (in any direction) in the same plane be in equilibrium, the algebraical sum of all the moments of the forces taken around *any* point in the plane must be *zero.*

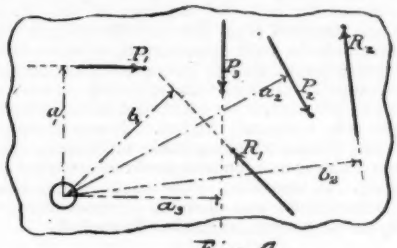


Fig. 4.

As an illustration of this, let the body in fig. 4 be in equilbrium when acted upon by the forces shown by the arrows P P_1 &c. Then taking moments round *any* point in the same plane (say ⊙), we have $P_1 a_1 + P_2 a_2 + P_3 a_3 = R_1 b_1 + R_2 b_2$.

V.—In the *graphical* treatment of forces, the whole of the external forces acting upon a body in equilibrium *must* form a *closed polygon*—reading one way round.

VI.—Any force may be resolved into two rectangular components without disturbing the equilibrium of the body upon which it acts.

Having refreshed our memories with the above, nothing remains but to read through the "Review of a Criticism," bearing in mind that the established principles enumerated above are subscribed to by Rankine, Weisbach, Du Bois, and all the standard writers on the subject. The above laws do not, of course, comprise the whole of the principles of statics; but they are those which are directly violated in the "Review" under consideration, as will now be seen.

The whole plan and object of the "Review" is given in the words already quoted from its fourth paragraph. Then follows the application of the reviewer's own principles of mechanics to a very simple problem. A rectangle is given having a height

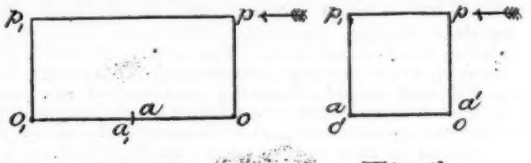


Fig. 5. *Fig. 6.*

equal to half its base (see fig. 5) acted upon by a horizontal force X at the top right-hand corner (*p*). This rectangle is supposed to be resisted at the two lower corners o_1 and *o*. It is required to determine the magnitude of the *vertical* reactions at o^1 and *o* respectively. The reviewer attempts to prove that the vertical force at *o* is $\frac{X}{4}$ and at o^1 $\frac{X}{4}$; or, to repeat his own words, "we get a vertical force upward at point *o* of $\frac{X}{4}$ and a like vertical force downward at o_1 of $\frac{X}{4}$." He then applies his reasoning to a *square* under similar conditions (fig. 6), and states, "We get X horizontal applied at *p*, equal to $\frac{X}{2}$ vertical at *o* and o_1 respectively . . . viz., $\frac{X}{2}$ + on one side, and $\frac{X}{2}$ — on the other side."

Now, a glance is, of course, sufficient to an engineer to see the absurdity of this. Applying Principles II. and IV. to the case of the *rectangle*, we have, if Mr. Gadd's results are correct, taking moments around *a* (fig. 5)—

$$\frac{X}{4} \times \overline{oa} + \frac{X}{4} \times \overline{o_1 a_1} = X \times \overline{op}.$$

But as *oa* and oa_1 are each equal to *op* (by construction), we can, of course, write the equation—

$$\frac{X}{4} \times \overline{op} + \frac{X}{4} \times \overline{op} = X \times \overline{op}.$$

Then dividing each side of the equation by *op*, we have—

$$\frac{X}{2} = X - \text{an utter absurdity.}$$

Again, applying the same tests to the *square*, and taking moments round *a* (fig. 6), we have—

$$\frac{X}{2} \times \overline{aa_1} = X \times \overline{a_1 p}.$$

But as $aa_1 = a_1 p$ (by construction), they may be cancelled; and we have remaining $\frac{X}{2} = X$. That is, the *half* of X = the *whole* of X—an absurdity.

In the case of the *rectangle*, the vertical force at o_1 should undoubtedly be $\frac{X}{2}$, and at *o*, $\frac{X}{2}$ acting in opposite directions. In the case of the *square*, it should be X at each place. If the test for equilibrium be now applied, it will be seen that these are the correct reactions, and not those given in the "Review."

It may be remarked that a *horizontal reaction* is needed so that the body may be in equilibrium; but with this the paper has nothing to do. If, however, the *principle of moments* be applied

* The reasons for this were clearly stated in the correspondence (see particularly my letters of July 29 and Aug. 12), though elaborate proofs were not entered into, as it would not only have overloaded the "Correspondence' columns, but engineers acquainted with theoretical and applied mechanics would not, for obvious reasons, require them."

at *any other point than one on the base-line*, this horizontal reaction must be taken into account in order to satisfy Principles III. and IV. The horizontal reaction must, of course, be equal to X, and its point of application may be at *o* or anywhere else on the base-line, as its exact point of application on that line will not affect the equilibrium (see Principle I.).

Having shown the absurdity of the leading idea in the "Review," it would appear almost unnecessary to pursue it further. The "Review," however, continues: "But lest our critic should again be tempted, . . . we will check off the foregoing plain mechanical demonstration with another." Then follow two statements by the reviewer (in *inverted commas*, be it observed) which are applied to fig. 7, to prove that "a force X

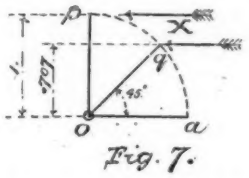


Fig. 7.

applied at *p*, horizontally, gives a vertical lift at *a* of X. But the same force applied horizontally at *q*, where the leg subtends an angle of 45°, gives a vertical lift of $\frac{X}{2}$!"

Now if the force X be applied as directed at *q*, it is obvious by Principle II., that the moment of X round *o* is X multiplied by the perpendicular distance of its *line of direction* from *o*—viz., 0·707 (if we call *op* = 1.) Therefore, by the principle of moments $\frac{0{\cdot}707\ X}{1} = 0{\cdot}707X$, which is the vertical lift at *a*, not 0·5 X, as given by the reviewer.

After such a glaring error, it is surprising to read the next paragraph, commencing "the whole of the foregoing demonstrations," &c., wherein an experiment is attributed to Rankine, which he would have utterly repudiated, and for which there is not the slightest foundation in any of his works. Indeed, it is entirely contrary to them; for if the results were as stated by the reviewer, it would be a direct contradiction to the *principle of moments*. Why, by Principle I., if the cord be attached at *either* of the holes along the top edge of the square (fig. 8), it cannot

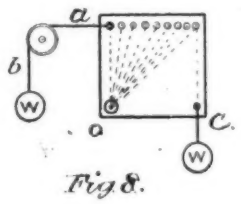


Fig. 8.

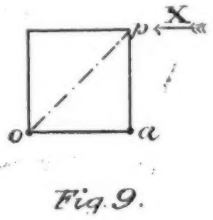


Fig. 9.

make the slightest difference to the moment of the force; consequently the weight *c* cannot *vary*. The erroneous idea, that the *moment* of a force will vary if its *point of application* be shifted along its *line of direction*, is applied in fig. 9 to a square, and it is again distinctly stated that the vertical lifting force at *a*, due to X horizontal at *p*, is equal to $\frac{X}{2}$, and that for the reason that "the *sine* of the angle is equal to the *cosine*!"

[*Note.*—In the second article of the "Review," there is some reference made to the experiment just drawn attention to, and it is spoken of as being "ambiguous." Why this is stated is best known to the reviewer; but there is certainly no ambiguity about the experiment as set forth in the first article of the "Review." It is undoubtedly a serious blunder; but it is plainly devoid of ambiguity. We are also told that there are *two* points of resistance *o* and *a*. Decidedly; but the vertical forces induced at *o* and *a* are *each* equal to X not $\frac{1}{2}$X as stated in the "Review."]

The author of the "Review" lays considerable stress on what he terms "the time-honoured one of triangulating the forces;" and he claims "to have vindicated the triangle of forces." It is much to be feared that if the principle of the triangle of forces rested on the vindication in the "Review," it would not be of much value. We know from the *triangle of forces* that *if three forces (not parallel), acting upon a body, keep it in equilibrium, the three forces may be represented in magnitude by the sides of a triangle respectively parallel to the forces*. This is, in fact, only a limitation of the general Principle V. It is obvious that the triangle of forces will not apply to *parallel* forces, as no two sides of a triangle are parallel; and so, in the case of the square (fig. 9) it will not give the *vertical* reactions *o* and *a* directly, because they are *parallel*. It can only be obtained by resolving the diagonal *op* into its rectangular components (see figs. 9 and 10). It may be as well to do this, as herein probably lies the key to the errors promulgated. Let fig. 10 represent a square; X a force acting upon it (whose magnitude is equal to *a*—to scale).* Draw

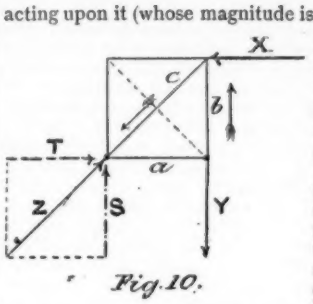


Fig. 10.

the diagonals of the square. Now, in order for this square to be in equilibrium, the force X must be resisted by two forces Y and Z [Y being vertical (by construction), Z inclined]. If these three forces, X, Y, and Z, keep the body in equilibrium, we know by the triangle of forces that they must be exactly proportional to the lengths of the sides *a*, *b*, and *c* respectively. (If this be doubted, proof can be given hereafter.) Now, supposing the two bottom corners of the square to be the points of resistance, the forces acting upon them will be Y and Z respectively. But Z is *diagonal;* and what we want to determine only is the *vertical* force acting at this place. It must therefore be resolved (by Principle VI.) into its two rectangular components, T and S, which it is evident (by construction) will be equal to *a* and *b* respectively.

Now, X being represented by *a*, Y must equal *b*, which in the case of a *square* is the same length. Therefore Y is equal to X. Again S is equal to *b*, which, as just stated, is equal to *a;* and therefore S = X. Hence in the case of a square acted upon by a horizontal force X (see fig. 10), we have demonstrated that the *vertical* reactions at the base are *each* of them equal to X—one acting *up*, the other *down;* and their *sum* is *zero*, not X as stated in the "Review." With respect to this last remark, it may be noted that unless their *sum* = *zero* Principle III. would be violated.

If, after all that has been said, the reviewer still maintains that the reactions at *o* and *a* respectively (see fig. 9) are only $\frac{X}{2}$, let him draw the *diagram of external forces* for the force X, and the reactions at *o* and *a*, making the *vertical* equivalent of these latter equal to $\frac{X}{2}$ each. He will find that the polygon will not *close;* thus proving, yet again, the fallacy of his reasoning, for Principle V. must be satisfied if equilibrium exists.

Part II., like Part I., of the "Review" is written with the main object of proving that the force *x*, applied at *d* (fig. 11), induces a lifting force at *c* of $\frac{x}{2}$ and a depressing force at *b* of $\frac{x}{2}$; the square being assumed "to be hinged at *o*, or turning on an axis at that point."

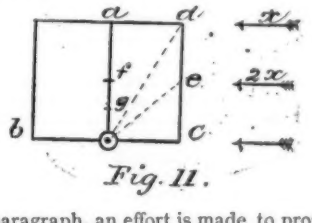


Fig. 11.

In the third paragraph, an effort is made to prove that if the force *x* be applied to *a* instead of *d*, a different lifting force would be induced on the point *c*. In reply, I need only call attention to Principle I.

Again, in the next paragraph, it is propounded, that "because the force 2*x* applied at the point *f*, with *one* radius of turn, gives a vertical force at *c* of *x*, therefore the same force applied at the point *e*, with *two* radii of turn, will give a vertical action at *c* of $\frac{x}{2}$." This is unique in mechanical literature, but receives its full answer in either a *properly conducted* experiment, or by a glance at the following diagrams:—

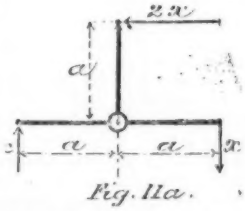


Fig. 11a.

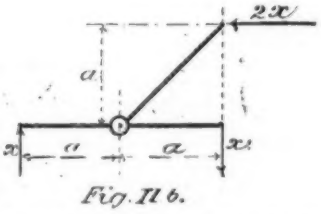


Fig. 11b.

The reactions to the force 2*x* in the two figures (11*a* and 11*b*) are precisely the same in magnitude, although the lever arm of the force in one case is vertical, and in the other it is at an angle with the horizontal bar. That the reactions are equal in the two cases is plainly evident from Principles I., II., and IV. O is the fulcrum, and the distances *a* are all equal.

From what has been said, it will be plainly evident to the

* Squares and rectangles of the proportions given in the "Review" are used in this article for the purpose of comparison; but, of course, the principles hold good whatever be the proportions of the rectangles,

youngest student in mechanics that the whole of the reasoning by which a serious error in mechanics has been bolstered up in the "Review," is entirely deceptive, and devoid of any proof. The *triangle of forces* has been shown to have been wrongly understood and applied, and the *principle of moments* violated.

Anyone acquainted with Rankine's or Weisbach's works, or indeed those of any other standard writer on the subject of mechanics, cannot fail to have been struck by the peculiar phraseology of the "Review of a Criticism." We are met with such expressions as "a single radius of turn;" "two radii of turn;" "mean activity of all the angles of the series;" "a false leg raised on the radius;" "that a neutral point must be a point common to all the resultants of the component force,"* and so on. The less said about these expressions, the better.

The remaining points in the "Review," requiring attention, will be dealt with in the concluding article, in which it will also be demonstrated *mathematically* and *practically*, how *considerably under-estimated* were the strains on the Gadd and Mason gasholder, in the paper read before The Gas Institute last June.

TECHNICAL RECORD.

THE FINAL REPORT ON LIGHTHOUSE ILLUMINANTS.

In our editorial columns last week, reference was made to the report which has just been presented to the Board of Trade by Sir G. Stokes, Lord Rayleigh, and Sir W. Thomson, on their examination, at the instance of the Board and Mr. J. R. Wigham, of the Trinity House report on the experiments conducted at the South Foreland a few years ago, to ascertain the relative merits of gas, oil, and electricity as lighthouse illuminants. At the close of the experiments, a series of articles thereon, by Mr. Harold B. Dixon, M.A., who conducted the photometrical tests of the illuminants employed, appeared in the JOURNAL (see Vol. XLVI.). The conclusions arrived at by the investigators will be found below; the principal being that "for the ordinary necessities of lighthouse illumination, mineral oil is the most suitable and economical illuminant, and that for salient headlands, important landfalls, and places where a very powerful light is required, electricity offers the greatest advantages." The question submitted to Sir G. Stokes and his colleagues was whether the conclusions were justified. The following is their report:—

We have the honour to report that, in accordance with your request, we have examined the report of Trinity House to the Board of Trade on the subject of lighthouse illuminants, with a view to expressing our opinion as to whether the conclusions of the report are justified by the record of the experiments contained therein. We further have had interviews with Mr. Wigham, who had furnished us, in a printed form, with the objections he had to urge; and have received from Trinity House replies as to one or two points on which we were desirous of further imformation. Two of us, moreover, have had the advantage of seeing on one occasion the experiments which were being carried on at the South Foreland.

We are not surprised that the splendid lights which have been erected at some points of the Irish coast on the system which has been so ably worked out by Mr. Wigham, should have created a strong feeling on the part of shipowners in favour of gas. But, obviously, the point which has to be considered is not what has been done in the past, but what can be done in the future. Does gas possess such advantages over oil as to outweigh the greater simplicity and economy of the latter illuminant; and should both, in the case of lights of special importance, be abandoned in favour of electricity?

It is hardly necessary to say that the experiments carried on at the South Foreland afford invaluable data towards arriving at a correct answer to these questions. The various measurements were carried on by independent scientific experts, whose eminence is a sufficient guarantee for the accuracy of the results. The estimations by the eye of the relative efficiency of the different lights as seen from a distance at sea were made by independent observers; and, as far as we are able to judge, the general testimony was impartially summed up.

In comparing the full powers of oil and gas for revolving lights, the Wigham quadriform gas arrangement, with 108 jets in each burner when at full power, was pitted against triform oil with 6-wick burners, which were the largest burners in each case that had at that time been introduced into the service. The height of the two columns, measured from the bottom to the top burner, was nearly the same in the two cases (very slightly greater for the oil); while the annular lenses employed had the same focal length and width in both cases, but were taller for oil than for gas. There would not have been room for these taller lenses with quadriform gas without making the column of light decidedly higher for the gas than for the oil; so that, on the whole, we think that triform oil with the higher lenses of the Eddystone pattern, was not unfairly pitted against quadriform gas with the less high lenses of the Mew Island pattern.

* This latter principle (?), we are told, can be found in any text-book on the subject.

An objection was raised by Mr. Wigham that he was not allowed to exhibit his "double quadriform" at the South Foreland. The duplication consists in placing two vertical columns of burners side by side; each burner of each column being provided with its own annular lens for each direction in which a flash is to be sent—the columns being placed at a sufficient distance apart to admit of this. Since a column of oil-burners could, for anything that appears to the contrary, be duplicated in this manner like a column of gas-burners, and the duplication would have materially increased the cost of the experiments, without, so far as we can see, any corresponding advantage, we think that, in determining the relative merits of gas and oil, the comparison was rightly confined to that of single columns in both cases.

For fixed lights, the same zonal lenses were employed for gas and for oil. As the oil-burners were farther apart than the burners for gas, there was thus left, in the case of oil, a small space above and below the zonal lenses which was unoccupied. This might have contained additional prisms, which would have somewhat, but probably to no great extent, increased the efficiency of the oil.

We see no reason to question the correctness of the comparison made between quadriform gas and triform oil, whether for revolving or fixed lights. The considerable difference in size of the flames of the 108-jet gas-burner and the 6-wick oil-burner entails, however, a difference in the possibilities of their application, about which it will be necessary to say a few words. When these burners are furnished with annular lenses of similar apertures and focal lengths, the diverging beam from the broader flame of gas is, of course, for equal velocities of rotation, of longer duration. This is an advantage in respect to facility for descrying the light in difficult circumstances of weather—such as suddenly varying showers of rain or snow—and for taking compass bearings even in the finest weather. The comparatively long duration of the flash consequent on the size of the flame has been taken advantage of by Mr. Wigham for the introduction of his group-flashing system, by which it is sought to give each light a distinctive character. The experiments showed, however, that the number of flashes in a group was somewhat uncertain, for reasons which are tolerably obvious—a circumstance which limits the extent to which the distinctiveness thereby given can practically be carried out with revolving lights, though the intermittence is advantageous in other respects. With fixed lights there is no such uncertainty in the application of intermittence to give distinctive character.

Gas naturally lends itself more conveniently to intermittence than oil, since with gas a perfectly sharp transition from light to dark, or the converse, is effected by turning off or turning on gas; whereas with oil the transition has to be made mechanically by means of shutters or screens, and is less sharp. This, as far as it goes, gives some advantage to gas, even independently of the consideration of the saving of the illuminant.

When the illuminant is gas, the burners can be so arranged that, in the intermittent working when the gas is turned on, that issuing from the previously idle jets does not take fire till there has been some escape of gas; and the gas so escaped on catching fire produces a sort of explosion, which Mr. Wigham claims can be seen farther than the steady light even at the full. It seems likely enough that there might be some gain this way, but probably to no great extent, so long at least as the only question is how far the light can be seen directly—that is, otherwise than merely through the illumination of fog.

The question of the temperature produced by the burning of the illuminant is one which must not be passed over in comparing the relative advantages of gas and oil. In actual practice, the burner is surrounded on all sides laterally by an enclosure formed of lenses and prisms; and this again is enclosed within a glazed covering. It will be convenient to use a name for the former; and as the term "lantern" is applied to the latter, the former may be called the "optical cage," or simply the "cage."

In the experiments carried on at the South Foreland, two only of the six panels belonging to a hexagonal cage were used; the remaining sides in the case of oil, and at first in the case of gas, being left open to the air of the lantern. The cage for gas was afterwards completed by sides of corrugated iron. As the cage for oil was not complete, the temperature of the air within it would doubtless be not quite so high as if the burners had been inside a complete optical enclosure; and Mr. Wigham suggested that it was not proved that mineral oil could be burned with safety under these conditions in burners above the lowest. We have, however, received information from the Trinity House that already two lighthouses have been erected in the Scilly Isles, in which mineral oil is used in both burners of a biform arrangement. On the other hand, the temperature within the cage for gas must have been more or less exaggerated, as compared with practice, for two reasons. The flues for carrying off the products of combustion were not protected by an outer casing with badly-conducting material between, as was done for oil, and would doubtless be done for gas if required; and the sheet-iron sides must have arrested a portion of the heat from the burners, which, if the sides had been of glass, would have passed through them in the radiant form. But while these differences of treatment between gas and oil may have tended to increase the observed difference of temperature in the lanterns, a part, and

probably the greater part, must have been due to the nature and rate of consumption of the illuminants, since there can be no reasonable doubt that, even for the same quantity of light produced, decidedly more heat would be given out by the combustion of gas than of oil; and the quantity of light given out by a 108-jet burner was found to be much greater than by a 6-wick burner for oil. The effect of the higher temperature on the health of the light-keepers would be a serious consideration were it not that, as there are no wicks to trim, the keepers who have gas to attend to have little or no occasion to go into the cage while the burners are alight. In the course of the experiments with gas, some of the lenses were found to have been cracked, probably in consequence of the heat. Such a result has not, however, so far as we know, been observed in actual practice. If, however, the column of gas-burners were duplicated, as has not at present been done in actual practice, the effects of the very high temperature might not improbably be serious.

The question whether oil gas might not with advantage be substituted for coal gas seems well worthy of consideration—at least if there be any thought of employing gas instead of oil. The greater simplicity of its production and the smaller space required for the generating apparatus, as well as its higher candle power, are strong points in its favour. It did not perform well in the Foreland experiments; but then the burners employed were intended for use with coal gas. The superior candle power of oil gas as measured on single jets might probably be brought out in compound burners by a modification in the construction; but it did not enter into the design of the Foreland experiments to try what form of burner might be applicable to an illuminant which has not hitherto been used in the service.

The experiments carried on at the South Foreland on gas as an illuminant were chiefly made with the Wigham burner; but some trials were made with burners of other kinds, especially the Douglass ring burner. The photometric measurements show that for a given consumption of gas the Douglass burner yields more light than the Wigham; while from the smaller dimensions of the flame of the former, the brightness of the flash, when seen through an annular lens, is considerably in excess of that in the case of the Wigham, and the breadth and consequent duration of the flash, at the expense of which the greater concentration is obtained, is still sufficient. So far the superiority of the Douglass burner seems to be decided. But it is possible that the use of a glass chimney might prove to be an objection, since, in the case of a fog suddenly arising, the full power of the gas could only gradually be let on, as otherwise the chimneys would probably give way; and the fracture of a chimney at a critical moment might seriously interfere with the efficiency of the light.

The quantity of light given out by the powerful electric light apparatus employed at the South Foreland was so enormous that, as might have been expected, electricity showed itself, under the conditions of the experiments, superior under all circumstances to both gas and oil. It is true that the quality of the light is such as to cause it to be more cut down by haze than is the light from gas or oil. But, as is remarked in the report, when it has been deprived in great measure of the highly-refrangible rays in which it so much abounds, by passing through a sufficient length of the haze, in its further progress it is not more cut down than the light from gas or oil; and the initial intensity is so great that it still retains its superiority.

There are, however, some considerations which seem to render the superiority of electricity not so great as might at first sight appear. The great power of the electric light for carrying to a distance in clear weather depends partly upon the large quantity of light emitted, partly on the smallness of the luminous area, which is the source of light, rendering the condensation of the light, by the optical appliances used for revolving lights, much greater for electricity than for the highest powers of gas or oil, as is shown by the large values of the "factor of lens" for the electric light. This high condensation is, of course, obtained at the expense of the angular opening of the transmitted beam; and, in practice, the angle in a vertical section of a beam must be sufficient to allow the beam to strike the sea from the horizon of the lighthouse to a point at a moderate distance from its base—an angle which will, of course, be so much the larger as the elevation of the lantern above the level of the sea is greater. The photometric measurements were naturally made in the full beam, and the angular width of this in a vertical direction was less than with the taller flames of gas or oil; so that occasionally the carbons had to be raised to bring the full beam down to the station from which it was to be observed. The wider beams from gas or oil did not require this adjustment. In practice, the upper portion of the full beam must reach the horizon; and it does not appear whether on this condition the width was sufficient to allow the beam to illuminate the sea with practically its full power at a sufficiently moderate distance from the base, and, if not, in any theoretical comparison of the efficiency of the three illuminants at moderate distances, it would be requisite to bear in mind that the electric light should not be taken as at its full power.

In what precedes we have principally had in view the case of revolving lights, the chief object of which is to guide the mariner from a great distance. As regards fixed lights, we need hardly consider electricity, which is not at present likely to be employed for that purpose (unless in some cases for indicating danger in certain azimuths by introducing red glass), but may confine ourselves to gas and oil. The experiments, as mentioned in the conclusion of the report, proved "that when showed through fixed lenses, as arranged in the experimental towers, the superiority of the superposed gas is unquestionable." It does not, however, therefore follow that, in the various lighthouses around our coasts in which fixed lights are shown which are obtained from the combustion of oil, arrangements should be made for the substitution of gas when the locality affords room for the erection of gas-works, nor even that, in the erection of a new lighthouse, gas should be preferred to oil. Though the 6-inch burner for oil is the most powerful yet introduced into the service, oil-burners were tried of still larger size, and were found to give considerably more light, though they were hardly introduced into the competitive trials; and if no objection should be discovered in their practical application, an increase of power, if required, could doubtless be obtained in this way at much less cost than by transforming the station into one for gas. The question, however, is not one solely of penetrative power. Gas yields itself with special facility to the conferring on a fixed light of a distinctive character by means of intermittence, and that by an actual saving of the illuminant.

The report next deals at some length with the subject of the illumination of fog; the conclusions arrived at being that the fog-illuminating power of the electric light would be much smaller in proportion to its power for direct penetration than would be the case with oil, and still more with gas, though absolutely, in consequence of its immense initial power, it was found to be, even in this respect, the most efficient of the three. The reporters think there is reason for supposing that, even for the same light and the same lens, the relative importance of fog-illumination and direct penetration will depend on the thickness of the fog, supposed to be uniform, and the consequent distance from the lighthouse at which the light could first be seen directly.

The report closes with a summary of the reporters' opinions on the question submitted to them, expressed in the form of comments on the conclusions contained in Part I. of the Trinity House report. These were as follows:—

I.—That the electric light as exhibited in the "A" experimental tower at South Foreland has proved to be the most powerful light under all conditions of weather, and to have the greatest penetrative power in fog.

II.—That, for all practical purposes, the gaslight, as exemplified by Mr. Wigham's multiform system in "B" experimental tower, and the oil-light, as exemplified by the Trinity House Douglass 6-wick burners in multiform arrangement up to triform in "C" experimental tower, when shown through revolving lenses are equal, light for light, in all conditions of weather, but that quadriform gas is a little better than triform oil.

III.—That, when shown through fixed lenses as arranged in the experimental towers, the superiority of the superposed gas-light is unquestionable. The larger diameter of the gas-flames, and the lights being much nearer to each other in the gas-lantern, give the beam a more compact and intense appearance than that issuing from the more widely separated oil-burners.

IV.—That, for lighthouse illumination with gas, the Douglass patent gas-burners are much more efficient and economical than the Wigham gas-burners.

V.—That, for the ordinary necessities of lighthouse illumination, mineral oil is the most suitable and economical illuminant; and that for salient headlands, important landfalls, and places where a very powerful light is required, electricity offers the greatest advantages.

The conclusions of Sir G. Stokes and his colleagues are:—

I.—We think that the experiments establish the superior power of the electric light as exhibited at the South Foreland under all conditions of weather, &c.

II.—We think that the statement here made of the relative efficiency of gas and oil for revolving lights is borne out by the experiments.

III.—The same may be said of the superiority of the superposed gaslight as shown through fixed lenses. As regards the cause of the superiority, we should be disposed to attach chief importance to the circumstance referred to in the body of the report—that, inasmuch as in this case the light is condensed by the optical apparatus in vertical planes only, the inferiority of the oil-light as regards the initial quantity emitted is not compensated as with annular lenses by its superior condensation, arising from the smaller width of the flame.

IV.—We think that the photometric measurements established the superiority of the Douglass to the Wigham burner, as regards economy and the efficiency arising from greater concentration of light. Whether the employment of glass chimneys forms any serious drawback, is a matter about which we have no information.

V.—Though gas possesses undoubted advantages over oil in some respects—such as facility in increasing the power on the sudden occurrence of a fog, absence of the necessity of trimming, power of making instantaneous transition from light to darkness, and conversely—we do not think these advantages sufficient to outweigh the advantages which mineral oil possesses for ordinary employment on account of its simplicity and economy. We think, too, that, for specially important sea lights, the experiments show that electricity offers the greatest advantages. At the same time, we see no reason for confining

the choice to these two alternatives; nor does it appear that the words of the report so confine it. There may be special reasons in particular cases for giving the preference to gas; and it seems even desirable that mariners should have the opportunity of witnessing the effects of different systems, which would thereby be subjected to the test of long-continued practical experience.

REGISTER OF PATENTS.

Manufacture of Gas on the "Dinsmore" Plan.—Fergusson, J. H., of Liverpool. No. 15,947; Oct. 10, 1889. [8d.]

This invention has reference to systems of manufacturing illuminating gas from coal in which the gas, subsequently to its production in externally heated closed retorts, is subjected to a further process of heating, effected by causing it to pass through a duct, chamber, or "fixing-retort" heated to the requisite temperature. The patentee disposes this reheating duct, chamber, or retort above, or in the upper part of a bench of distilling retorts, but separated therefrom by a wall or partition. In the wall, however, apertures are left to permit the heating gases to pass to the space or chamber in which the fixing-retort is placed. The gases which it is preferred to use (at any rate for the most part) are those which have been employed in heating the distillatory retorts, and which, therefore, may be termed "waste" or residuary gases. The apertures above mentioned, through which the gases from the bench proper pass to the ducts or fixing-retort heating space or chamber, are controlled by dampers or valves, so as to regulate the temperature at which it is desired to work the duct or retort.

One convenient arrangement of duct according to this invention, when applied to existing benches of retorts, is to dispose it above or outside the existing arch of the bench, and to form a suitable space around it, through which the heating gases pass on their way to the flue; the aperture in the arch through which the heating gases flow being provided with damper-valves to control the heat of the duct. The duct may be of single form, having an inlet at one end; the gas being transmitted directly into it through a valve, or valve-controlled conduit or chamber. Or it may be of twin or double form, through which the gas passes backwards and forwards; and it may be arranged with an artificially cooled pipe or passage on it, so that the gases under treatment are heated, cooled, and then reheated. In any case an artificially cooled pipe is provided on its outlet. When the interposed cooling-pipe is used, tar may be introduced into the duct at this point, or at any suitable point of the duct whatever its form.

In the case in which the gases are led directly from the retorts to the duct, so that the heavy or tarry non-permanent vapours do not condense before they are subjected to the influence of the duct, it is proposed to employ a long duct or retort, and subject the vapours to heat for a considerable time, in order to render permanent the greater portion of the tarry or heavy matters therein. But (says the patentee) the temperature of the duct should not be more than from about 1000° to 1200° Fahr.; otherwise injury may be done to the other lighter hydrocarbon gases. Also at the point near where the cooling-pipes are employed, it should be shielded from the heat, to prevent the pipes connected with it becoming blocked.

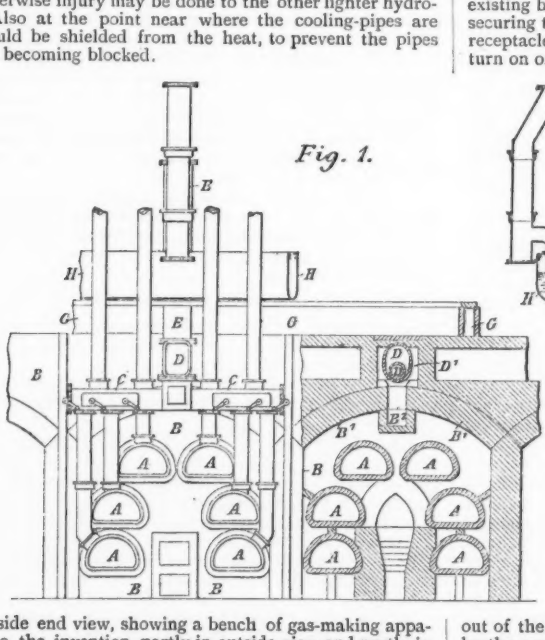


Fig. 1.

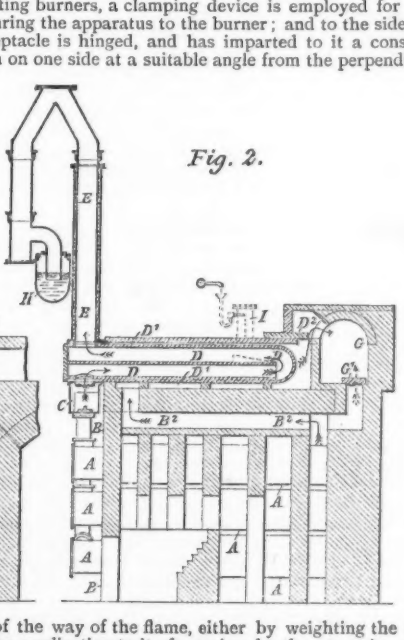


Fig. 2.

Fig. 1 is an outside end view, showing a bench of gas-making apparatus according to the invention, partly in outside view and partly in section; and fig. 2 is a longitudinal section.

A are ordinary gas-making retorts, set in a bench B, and heated by a fire in the usual way. C is a chamber into which the gases from the retorts pass; and D is the fixing-retort, into and through which the gases flow from the retorts on their way to the gas-main. The gas passes from the retorts A^1 to the chamber C by pipes, the inlets of which into the chamber are controlled by valves worked from outside by handles. The entrance from the chamber C to the fixing-retort D is also controlled by a valve. The heat used to raise the fixing-retort to the requisite temperature is derived from the waste gases from the bench B; so for convenience the retort D is situated between the two benches B, and outside the arches B^1. The heat of the fixing-chamber is regulated by means of valves, so that the gases (whether waste or live gases) are caused to pass from that part of the bench in which retorts A are disposed, to the space in which the fixing-retort D is placed, or partly to it, and partly away to the outlet-flue G. These passages are as follows: B^2 is a passage (which the heated gases enter after having heated the retorts A) formed by the brick walls or partitions. From this the gases pass either to the chamber D^1, in which the fixing-retort D is placed, or else direct to the flue G. The flow to the space D^1 and flue G is controlled by the dampers G^1 and D^2, which latter is provided in connection with the outlet passage of the space D^1—that is to say, if the damper G^1 is shut and the damper D^2 is open, the waste gases from the bench B all pass by way of the passage B^2, into the chamber D^1, and heat the fixing-retort D. Then, as the heat of this retort is greater or less than that required, the passages are more or less covered or uncovered by their respective dampers; and this, of course, causes more or less of the gases to pass by way of the space D^1 to the flue G. The fixing-retort D, it will be seen, is of a return type—that is, the gas entering it passes from the front to the back, and then back again to the front, by means of the web inner pipe shown. After the gas leaves the fixing-retort D, it is cooled by passing through the pipe E, round which a current of water or other cooling fluid is caused to flow. After leaving the pipe E, the gas travels to the ordinary hydraulic main H. When the fixing-retort D is open (or when otherwise desired), the gas from the chamber C is caused to pass to the hydraulic main H direct; and to prevent the gas passing thereto and under ordinary working conditions, the dip-pipes thereof dip deeper into the liquid therein, than does the pipe leading from the pipe E.

The process, and effects thereof, according to this invention, are as follows: The coal is distilled in the retorts A in the usual way. The gases pass by the chamber C into the fixing-retort D; and from thence they flow through the cooling-pipe E, finally arriving in the hydraulic main H—that is to say, after distillation the gases are first heated, and then artificially cooled as they leave the heating-retort D. The cooling of the gas after and upon leaving the fixing-retort D by the cooling-pipe E is essential, as it prevents pitch forming in the outlet and other pipes, and their becoming blocked up. It will be seen that the gas passes direct from the retorts A into the fixing-retort D by way of the chamber C; and by this means, the condensible matters in the gas do not condense before they enter the fixing-retort D. However, the vapours are not wholly rendered permanent by the process; and, in order to utilize the tar condensed from the gases by the ordinary condensers, this tar in a liquid form (or part of it) may be redelivered into the fixing-retort D by the pipe I, or in any other suitable way.

Lighting Gas.—Clarke, C. L., of Manchester, and Briggs, A. L., of Withington. No. 18,357; Nov. 16, 1889. [6d.]

These improvements refer to the cage or receptacle containing occluding material employed for gas-lighting purposes as described in patent No. 466 of 1889; and it consists in so mounting the receptacle upon a hinge or pivot with regard to the burner that, in its normal position, its contents shall be out of contact with the issuing flame, but which shall be capable of being turned into contact with the issuing gas only at the instant of lighting the gas. As applied to existing burners, a clamping device is employed for surrounding and securing the apparatus to the burner; and to the side of the clamp the receptacle is hinged, and has imparted to it a constant tendency to turn on one side at a suitable angle from the perpendicular, so as to be out of the way of the flame, either by weighting the cage on one side by the application to it of a spring, by the expansion of a metallic rod, or in any other equivalent manner.

Gas-Burners.—Leech, A., of Longsight, near Manchester. No. 18,461; Nov. 19, 1889. [6d.]

Yet another "perfecter" of the Scholl type! This "invention" has for its object "to provide means which will increase the size of the flame of the burner, and make it more illuminate at a less consumption of gas, than heretofore has been the case." It consists principally in the employment over the top of the burner, between its holes, of a metal plate which acts as a spreader. The top edge of the plate is preferably rounded off, and the bottom formed with two legs in such a manner as to leave a small clear space between the top and side of the burner and the respective edges of the metal plate. The patentee says that, "on the gas issuing from the holes of the burner,

it passes along the metal plate, which when the gas is lit, then causes a spreading of the flame both in height and width."

APPLICATIONS FOR LETTERS PATENT.

16,659.—WELLS, J., "A new or improved device for preventing the deflection of the flame in gas-fires and the like." Oct. 20.

16,738.—JONES, F. J., "An improvement in the manufacture of coke and gas." Oct. 21.

16,821.—HESKIN, T., "Improvements in appliances for producing light by incandescence." Oct. 22.

16,909.—SHAW, J., "Improvements in gas motor engines." Oct. 23.

16,912.—GOEHIDE, R., "Improvements in cocks for mixing gas and air." Oct. 23.

16,983.—HILL, L., "An improved water-meter." Oct. 24.

17,000.—THOMAS, J. J., "Coal gas generating apparatus." Oct. 24.

17,029.—TULLY, W., and CORBETT, J., "Improvements relating to gas or other burners." Oct. 24.

17,071.—BURT, P., "New or improved gas-engine starting, stopping, and reversing gear." Oct. 24.

The Glenboig Union Fire-Clay Company, Limited, have been awarded a gold medal at the Leeds International Exhibition for their exhibit, comprising fire-bricks, silica bricks, gas-retorts, and other fire-clay manufactures. They also obtained a similar award at the Edinburgh Exhibition.

Settlement of the Gas Dispute at Monmouth.—A special meeting of the Monmouth Town Council was held last week to again consider the public lighting question. The Gas Company offered to light the public lamps for £300 per annum, instead of £400 as at present, the lamps not to be lit from the middle of May to the middle of August. The Council accepted this; and so ends the dispute which has existed for three months.

The Electric Lighting at Barnet.—More complaint has been made by the Barnet Local Board of the deficient lighting furnished by the electric lamps; and the contractor (Mr. Joel) has been again remonstrated with on the subject. At the last meeting of the Board, his reply was received; and its reading caused much amusement. He said he had ordered a number of 32-candle power lamps for use at Barnet, but that the maker had sent 50-candle lamps instead; so that the district was actually being lighted by 32 and 50 candle power lamps. When the mirth which this statement produced had subsided, a proposition was brought forward that the thanks of the Board should be given to the contractor for his generosity. But this did not find a seconder; probably from the fact that it was regarded as sarcasm. A member asked the Clerk if his eyes had not played him false; causing him to read 50 for 15. The Clerk replied that the figure was 50. In the whole history of this extraordinary lighting undertaking, nothing has equalled this. As the local paper remarks, "The wildest dreams of the most enthusiastic resident never suggested a ray in excess of the contract light; so the Barnet Local Board may be pardoned a little surprise at the revelation."

Mr. Binnie's Report on the Water Supply of London.—Mr. A. R. Binnie, the Chief Engineer of the London County Council, has (the London correspondent of the *Manchester Guardian* writes) completed his report on the water supply of London; and it will be found of first-rate importance. It shows conclusively that at no great distance of time London must have a new source of supply, which may be obtained either from the Upper Wye or the Upper Severn, or from Dartmoor. Dartmoor has not been suggested before as a source of supply for the capital; but its elevation, heavy rainfall, and clean granitic gathering-ground make it a site where good water could be obtained, and its distance is not against it. Mr. Binnie's report (the correspondent goes on to say) will no doubt alter the present position of the water question; for if a new source of supply has to be obtained, it will not do to give the existing Companies the present market value of their shares or their dividends. Again, if there is to be a competing scheme, it is not the Companies but the town which must do it; and if once there is a competing scheme, where will the Companies be? It is now thought that the Council will not agree to the arbitration clause such as the City propose in their Bill; and it is stated that the Council will introduce a Bill of their own, providing, so far as they can now provide, for a new source of supply. The estimated cost of the Upper Wye scheme is £9,000,000, to supply 230 million gallons per day; and that of the Upper Severn is £11,400,023, to supply the same quantity.

Electric Lighting at Taunton.—The principal streets of Taunton, which are lighted by electricity, were in darkness for nearly half an hour last Tuesday evening. The larger number of the arc lamps "sparked" violently between five and six o'clock, causing much commotion, with horses shying, and other troubles. Eventually all the lamps went out. The staff from the electric light works replaced some portion of one of the lamps, and then they were able to light up again, and go on all night. On the following day the men were engaged in renewing the wires to the lamp which apparently did the mischief. The same lamp caused similar trouble a week or two ago. We learn that within the past two months the streets have been in darkness four or five times, to say nothing of many extinctions of one or two lamps for periods extending from 20 minutes to an hour and upwards. It is scarcely necessary to say that no notice of these lapses on the part of the electric light are taken note of by the local papers. With regard to the business of the Electric Light Company, it must be admitted that it has increased by the accession of some of the Gas Company's customers; but it is questionable whether the latter are quite satisfied with the change—the incandescent electric lighting not being half so good as the gas it displaces. Some of the churches and chapels have been offered a supply of current free for three years, conditional on the first cost of the installation being paid. The sum asked for this varies, we understand, from four to eight times the cost of gas lighting for one year. The managers of these places have not "snapped" eagerly at the offer; but it is under consideration in several cases.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Gas Workers' Union and its Executive.

SIR,—W. H. Ward has at last thought fit to reply; but in what a fashion! He does not answer the very fair questions you put to him in the JOURNAL for Sept. 2; he carefully evades them, and we are still without that information. Instead of it, he treats us to a strange conglomeration of mixed-up twaddle, without any meaning or point. My letters appear to have come home to him. The cap fits, and makes him angry. Agitators and such-like folk do not like to see or hear the truth; it makes them wince when the hollowness of their pretensions are exposed. Consequently, W. H. Ward is very angry; and, like some angry people, he takes to the use of bad language and calling names, which is another sure sign of a failing cause.

No doubt he would be glad to get hold of my name, as he seems so terribly anxious about it; but as there is such a thing as being boycotted and intimidated, it is quite sufficient for the purpose that you know my name, and it cannot in the slightest degree concern W. H. Ward whether my name is Bill Jones or Professor So-and-So. What is wanted is a true and correct statement of the amount of what he calls "strike pay," which, he says, was paid to the strikers for 17 weeks, and an answer to the other queries you put to him on Sept. 2.

W. H. Ward appears to be getting on in the world, and has before informed you that he was a collier, working in the pits; then a gas stoker, and is ready to be a stoker again "when his clients think fit to remove him;" and now he is in business—he has "been in Ireland on business." How grand it sounds; and Irishman do love to make a splash. Let us hope it is such a business that will keep him, so that he may not be dependent upon the weekly twopences of the stokers, which he finds it so difficult to get in. But can it be possible that he has only been across the water to advise with an old friend and crony, a brother agitator in the Gas Workers' Union, who not long ago was charged with intimidating "freemen," and who is now, and has been for some time, stirring up strife between employers and workmen in the Sister Isle?

Then W. H. Ward says: "When that unfortunate affair took place." What "unfortunate affair" can he allude to? for his rigmarole of a letter is so mixed up, that it is difficult to make sense of it; but it seems to be in connection with some man he wants to meet face to face in your office, and give him a week's wages. This would imply that Ward is at work, earning weekly wages. Can this be so? And how much would the amount be? No, no, Ward; that offer is not good enough. There must be a definite sum stated, and some other *rendezvous* than your office, Sir; for it would never do to bother you with stokers' quarrels. He has the unblushing audacity to suggest that you should set apart a room for him to meet some one. He must name another place for the meeting, and some one other than himself to meet the late strikers. As I said before, there is such a thing as intimidation.

Ward does not seem to be very careful of his boast at being "a dab at the pen;" for the latter part of his letter is not at all clear as to what amount and for how long the strikers were paid. At one place he says 10s. for eleven weeks; then breaks off into bad language again about giving the lie to a rag, and says: "We paid them 8s. per week, and the last two weeks we gave them 2s. per man"—and he call that "strike pay." How generous! No wonder the old strikers love him so. And can that be the amount of strike pay the stokers will have to look forward to when he next tells them to "down tools?" It is well the "poor dupes" should know what to expect.

Of course, it was only to be supposed that he and others of the Executive are awfully sorry (which he, with evident pain, unwittingly acknowledges) to see and know that the Chartered Company have 3000 beds, and other things in readiness at Beckton, as well as at the other works, to meet any of the blatant demands of the Union; and just notice the hypocrisy of his closing sentence—"causing them to go to such unnecessary expense." Much he cares what expense he causes others to be put to, so long as he and his Union get their own way. It is very strange these poor stokers—perhaps it would be better to put it in his own words, thus: "When our clients think fit to remove us"—it is strange, I say, they do not see fit to remove him and others who are misleading them. If they will only look at page 917 of the last number of the JOURNAL, at the tenth line from the top of the right-hand column, they will read, "or a saving of more than 70 per cent. in cost of labour." Can Ward and the stokers work out that little sum, and see what it means—that only three men are required to do the same amount of work as it takes ten to do now? Can it be possible the stokers do not see the "hand-writing on the wall" in that sentence? Let them be wise, and take warning in time.

With regard to the letter signed "R. Westlake," he does not seem to understand the matter at issue, and muddles things up somewhat, like Ward, and repeats again the oft-told misrepresentation to the stokers which the Chairman of the South Metropolitan Gas Company has so often pointed out as not being true—that "the Union gained for them the eight-hour day." And Westlake may as well be informed again that the Union did nothing of the kind, although they strive very hard to take credit for it. It is well known that, in the case of the Gas Company on the south side of the water, the men were offered eight hours a day, and would not accept it until twelve months afterwards; and when they asked for it, it was granted at once. But, reading between the lines of Westlake's letter, it would seem as if he also belongs to the Executive, and lives on the bread and butter bought with the money earned by the stokers. To show how these poor fellows are still being "bull-dozed," I enclose a notice of the meeting held on Peckham Rye last Sunday. You may like to give it in the JOURNAL as a sample of what Ward calls the "friendly terms we are on with that Company;" and especially note the last part of it—the appeal to the non-Union men of the Gas Company on the South side of the Thames. At the meeting, poor Thorne looked in a sorry plight at the handful of "rag, tag, and bobtail" following a few old stokers, who were hardly strong enough to hold up the banner. If these are his Union men, he

is quite welcome to them and to keep them on "strike pay," for there is no room for such scarecrows in a retort-house.

Oct. 31, 1890. IN THE KNOW.

[The handbill referred to by our correspondent is headed, "Federated Union, No. 4.—One man one ticket is our motto." It sets forth that the National Union of Gas Workers and General Labourers of Great Britain and Ireland has now 120 branches in England and Ireland; and that its objects are "(1) to secure higher wages for its members, (2) to reduce the hours of work, and (3) to defend the interests of its members in all labour disputes." The entrance fee is 1s., and the contributions 2d. per week. The appeal to the men on the south side of the Thames, mentioned by our correspondent, runs thus: "All the South Metropolitan Gas Company's non-Union men are invited to show up and join the Union, which has secured them the eight-hour day, and show to the world you are men still." Dr. Aveling was announced to preside at the meeting on the 26th; and addresses were to be delivered by Messrs. Thorne, Ward, and others.—ED. J.G.L.]

The Water Supply Inquiry by the Corporation of London.

SIR,—Referring to your article on this subject in the last number of the JOURNAL, and the allusion to a letter from Mr. E. K. Burstal, which, you observe, effectually controverts sundry statements . . . of Mr. Jabez Hogg, permit me to say, in reply to Mr. Burstal's letter, that he is in error in stating that Mr. Hogg's remark (p. 77)—that "the whole of the water supply of the City of London is of very indifferent quality, and some of it quite unfit for use"—"was allowed to pass, and was never controverted." This is contrary to the fact. In my evidence on July 29 (which I gave, by the way, as an "independent engineer," employed by the Committee, and in no sense "*officially*") I especially stated, from an experience extending over many years, and from almost daily acquaintance with the water for the last twenty years, as to the New River (p. 172), that "the water supplied by the Company is invariably good. I think, with one or two exceptions, it has stood second in the list of water supplied to London." I also handed in a report, specially prepared for the Committee, on the sanitary condition of the Lea (Appendix, p. lxix.). Again, on p. 176, I say: "There is no reason for saying that the water supply to the City is bad; on the contrary, the monthly analysis by Dr. Frankland shows it is good. I cannot conceive how, within reason, anybody can come here and tell you that the water from the New River is contaminated by sewage to begin with, and that the analysis of the water is bad, in the face of the analysis, not only by Dr. Frankland but by other independent chemists."

I also offered (p. 177) certain suggestions to the Committee as to safeguarding the sources of supply, which have been approved, and form one of the recommendations of the report which has been adopted by the Corporation—viz., that the duties which I have during the last 20 years exercised in the Lea watershed should be extended to all the sources of supply above the intakes; and, to quote from my own evidence (p. 177), "the sources of supply being properly looked after, would go far to remove the ever-recurring agitation for new sources. . . . I contend that, if the water supply of London were looked after by a properly appointed officer, we should hear very little more about looking for an additional new source, because there is plenty of water in the watershed of the Thames, and there is plenty of water in the watershed of the Lea."

I may have something more to say about the London Water Supply later on; but I trust you will give me the opportunity of correcting that which was, doubtless, an unintentional error on the part of your correspondent.

LAMOROCK FLOWER, Sanitary Engineer,
12, *Finsbury Circus, Oct.* 29, 1890. Lea Conservancy Board.

SIR,—The report of the Committee of the Corporation of London on the water supply was issued on the date of my letter published in the JOURNAL last week; and as I had not then seen it, I trust you will afford me the same opportunity of commenting upon it as you have already given me in regard to the evidence upon which the report is based.

Although dated Oct. 15, the copies were apparently not circulated until Oct. 26; and the delay is understood to have been caused by the non-completion of the map which accompanies it. It is, therefore, disappointing to find that this map is merely a plan of the watershed of the River Thames and River Lea containing no special features of interest.

The report states in its first paragraph, after reciting the constitution, &c., of the Committee, "there was a general consensus of opinion that the supply of water to the public should be in the hands of a public authority, and no longer remain, as at present, under the control of private companies." While admitting this, it is not surprising that such a recommendation should be made, since the evidence upon which it was adduced was entirely *ex parte*, and the witnesses were almost exclusively public officials or well-known partisans.

The next paragraph (unfortunately not being numbered they are not easy to describe without quoting from them) refers to the evidence of Mr. Archibald E. Dobbs, which is considered important—apparently in the highest degree, as it at once takes us to the eighth day of the inquiry. Mr. Dobbs says: "It is clear that customers, who, from their position or wealth, can make exceptional terms with the Water Companies, are thus able to obtain advantages which are not shared by the general public." Now this assertion of Mr. Dobbs is not so definite and clear as his unassorted "facts" referred to in my letter last week; but a careful perusal of his evidence shows that even his legal mind has doubts. On p. 145 he says, speaking of the charge for gardens, "in almost all cases the claim is illegal, but is continually made." On the next page he says: "With regard to those gardens, I should not like to say, as a barrister, what is the right mode of rating. The whole question is undetermined." Precisely so; then why condemn the method of charge, after confessing ignorance on the subject of its legality? What Mr. Dobbs's evidence does show is this—that the Companies have not rated many of the larger premises at the full amount they are entitled to; and this has been tortured into the charge in the report I have quoted. It is natural that companies whose primary duties it is to supply water should hesitate to embark in litigation with every barrister who trails his coat along for the purpose of having it trodden on; and they cannot be blamed for acting as Mr. Dobbs describes on p. 148: "I have known several cases in which they have taken every possible step to avoid litigation." This, in a lawyer's eyes, must be an awful course to pursue; but to those who have tasted law, even when on the winning side, such a proceeding seems to savour of common sense.

The Committee proceeded to visit Manchester and Glasgow. On p. 10, a tabulated statement of water-rates is given, comparing London and Glasgow. Why was not Manchester included? Not from want of information, because on page lxxxviii. of the evidence the Manchester scale of charges is printed; and I venture to say it compares unfavourably with the charges levied by the London Companies. Probably this supplies the reason of its omission.

The report (p. 5) recommends the Glasgow transfer as one to be followed in the case of London. Cannot a more recent precedent than 1854 be found? The Stockton and Middlesbrough transfer of 1878 and many others might be cited; but the case of the Metropolis is exceptional. A large proportion of the area and population supplied is outside the limits of the County Council, and a very small proportion inside the jurisdiction of the body initiating this inquiry; and eight Companies have to be dealt with. That the Committee have some idea of the magnitude of the task, is apparent from the fact that they say: "Many questions on the supply of water to so large an area . . . such as constant supply, hard or soft water, supply by meter, an alternative supply, have come before your Committee," and, with these few expressions, they relegate these questions "to the Public Authority when created."

The Committee recommend that a Bill should be brought in to deal with the question, and to create a body representative of the watershed area and the supply area, to "govern" the watershed and "manage" the supply. This body should confer with the present Thames and Lea Conservators, should have power to apply to Parliament for "alternative" schemes, and open wells without further application to Parliament. It is to contain representatives of the Municipal Corporations, County Councils, Sanitary Authorities, Corporation of London, London County Council, and, finally, a leaven of Directors of the existing Water Companies. Such a body would, I have no hesitation in saying, be an unwieldly and unsatisfactory one. It could hardly consist of less than 250 members, as the area above Hampton alone, taking no account of the vast district below—down to Greenhithe on the east, nearly to Hertford on the north, and to Selhurst and Farnborough on the south, which are approximately the present water limits—embraces "14 County Councils, several Municipal Corporations, 47 Urban and 80 Rural Sanitary Authorities," as stated on p. 6 of the report.

The present Boards of Conservators of the Thames and Lea are quite able to protect the watershed area; and if their parliamentary powers are, as is apparently the case, not adequate, let this be remedied. More than £21,000 is now paid annually to the Conservators by the Water Companies.

It should not cost a fourth part of this sum to keep the whole length of those streams free from all contamination. Besides, is it likely that members of public bodies, especially from districts so remote as to be above 100 miles from London, will be found ready to sacrifice time and money on such a quixotic mission as journeying to London to take part in the deliberations of a body engaged in managing the water supply to Londoners.

In conclusion, the Committee speak of this as their "first report." It is therefore probable that we have yet to hear something further on the subject. Whilst acknowledging its value, the report is disappointing in its conclusions and recommendations, and does not exhibit those evidences of exceptional ability such as the public had been led to anticipate, from the opening of the inquiry.

E. K. BURSTAL, M. Inst. C.E.
38, *Parliament Street, S.W., Oct.* 30, 1890.

Temperature of Gas-Flames.—A correspondent will be glad if any of our readers will inform him as to the best authority on the subject of the temperature of gas-flames with the same or different kinds of gas.

Alleged Forgery of Debentures of the Havant Gas Company.—An appeal in the action of *Gilletts v. The Havant Gas Company* came last Tuesday before Lords Justices Bowen and Fry. The plaintiffs are holders of debentures to the amount of £500, purporting to be issued by the Company, bearing its seal, and signed by three of the Directors. They fell due in August last; but on application being made for the money, the Directors refused payment, asserting that the debentures were not genuine, and that they would be prepared to defend any action upon them. The present action was thereupon commenced, and an application was made to the Vacation Judge to appoint a receiver. This he refused to do; each of the three Directors in question having made an affidavit stating that his signature was not genuine. It was from this decision that the appeal was brought; and Sir A. Watson, Q.C., who appeared for the plaintiff, said he had asked the Vacation Judge to allow the motion to stand over, in order that he might cross-examine the Directors, and he should be quite satisfied if this course were now adopted. Lord Justice Fry remarked that in such a case, where there was practically an allegation of forgery, the cross-examination ought to take place in Court. Sir A. Watson said his impression was that the deponents must have been under some mistake, and that, if the circumstances were recalled to their recollection in cross-examination, there would be no necessity to go to trial at all. He also pointed out that there was a further affidavit alleging that if the debentures were issued they were invalid, not having been sanctioned by a general meeting. This rather looked as if the defendants did not rely entirely on the allegation of forgery. Their Lordships did not take this view; and, after a short discussion, dismissed the appeal with costs.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Thursday, Oct. 30.

(*Before the* MASTER OF THE ROLLS *and Lords Justices* LINDLEY *and* LOPES.)

The Mayor and Corporation of Salford v. Lever—The Hunter Commissions.

This was an appeal by the defendant from the decision of Justices Denman, Charles, and Vaughan Williams, refusing a new trial of the action brought against him by the plaintiffs, under circumstances which will be in the recollection of our readers, before Mr. Justice Day at Leeds. The proceedings on the trial were reported in the JOURNAL for April 1 last (p. 598); those on the application for a new trial in the number for July 1 last (p. 36).

Mr. LAWSON WALTON, Q.C., appeared for the appellant; Mr. HENN COLLINS, Q.C., and Mr. C. GOULD for the respondents.

Mr. LAWSON WALTON said this was an appeal from an order of a Divisional Court refusing to enter judgment for the defendant, or alternatively to order a new trial. He appeared for the defendant in the appeal, and had to submit that the Court should have ordered judgment to be entered for him. The action was brought by the Corporation of Salford to recover from the defendant, as damages for fraud, the excess in price they had been compelled to pay for coals, owing to him having bribed one of their servants. The jury, by direction of the learned Judge, found for the plaintiff for the whole amount claimed —viz., £2339. Supposing this finding to have been correct, he had to submit that the defendant was not liable, because, by an agreement, the Corporation had accepted a certain sum in satisfaction. He could not find any precedent for the form the action took. The Corporation charged that one of their servants had induced them to enter into certain contracts for coals for their gas-works at a figure in advance of the market price; and they sought to recover the difference—saying that they had lost at least the sum claimed. The defendant not being able to deny the evidence, the Judge directed a verdict for the amount. For many years the gas-works of the Corporation were under the management of one Hunter. In the year 1886, in the course of a trial for libel at Manchester, the Corporation discovered that Hunter had for a number of years been receiving bribes from various contractors for the supply of coals; and on discovering this, they commenced the action. So far as the evidence went, these persons seemed to have sent in tenders, on which Hunter received a commission in consideration of his inducing the Gas Committee to accept the tenders and enter into the contracts. The Corporation commenced an action in the Chancery Division to recover the moneys thus received; and they prosecuted Hunter for having committed perjury in the course of the libel trial, and also for forgery. On both these charges he was convicted on his own confession, and sentenced to five years' penal servitude. Pending the sentence, the learned Judge who tried the case (Mr. Justice Hawkins) suggested that Hunter should make some reparation to the Corporation. Negotiations ensued, which resulted in an agreement dated Aug. 6, 1889.

Mr. HENN COLLINS remarked that he was instructed that the suggestion did not come from the learned Judge.

Mr. WALTON said he was instructed the other way, and had not heard it contradicted before. He did not know, however, that it was material, and would accept his learned friend's correction. He then proceeded to say that the agreement was a release of a joint cause of action against Hunter and Lever.

The MASTER of the ROLLS: You put it that it was a release from a joint liability, or satisfaction of a joint liability?

Mr. WALTON assented.

The MASTER of the ROLLS: That involves the question, then, whether there was a joint liability.

Mr. WALTON: The Corporation's action was in substance Hunter's action; and I will further say that as to £1500 which Lever paid to Hunter, it was at all events Hunter's action. We paid Hunter, and the Corporation got it from him; and, *pro tanto*, we have satisfied the cause of action.

The MASTER of the ROLLS asked if Hunter had paid anything.

Mr. WALTON said he had paid £10,000—or rather he agreed to deposit, and had deposited, securities to this amount. Then the Corporation, at Hunter's request, were to bring actions against various contractors who had bribed him; and they were to apply the sums they thus recovered against Hunter's liability for £10,000.

The MASTER of the ROLLS: This was after he was convicted?

Mr. WALTON said it was, and after Hunter was in prison. He submitted that this agreement was a release to Hunter; and it was sealed by the Corporation. The fact was the Corporation found themselves unable to do anything without Hunter's assistance. They had no information, and were unaware by whom the bribes were paid.

The MASTER of the ROLLS: Their position was: "You are a fraudulent scoundrel, a perjurer, and a forger; but if you will give evidence on our behalf, we will pay you back the money we get."

Mr. WALTON said the Corporation had not in any way impeached the agreement. Hunter proved that he had received £1500 from Lever; and it was further proved that the Corporation had brought actions, or made claims, against other contractors besides Lever, and had recovered £4000, which sum, therefore, stood to Hunter's credit under the agreement.

The MASTER of the ROLLS asked how this affected the learned Counsel's client.

Mr. WALTON said that, at all events, it should have been taken into consideration in reduction of damages.

The MASTER of the ROLLS: Hunter and the defendant cheated the Corporation out of thousands of pounds; and because they got it back from these persons, they are to be given credit for it?

Mr. WALTON: For this reason—that this action was brought for Hunter's advantage and benefit.

The MASTER of the ROLLS: Not a bit of it.

Mr. WALTON: The Corporation were suing these persons entirely for Hunter's benefit, and applying to Hunter's credit what the actions produced, so that we, who had paid Hunter £1500, had to pay the Corporation £1500 over again, although they had got it from Hunter. The Judge directed the jury to find for the whole amount—£2339.

The MASTER of the ROLLS: The amount out of which the defendant had cheated them.

Mr. WALTON said he should submit that the learned Judge was wrong, and misdirected the jury—firstly, because the Corporation had been cheated by the joint operation of two persons; and as they had released one of the two, the other was equally entitled to the benefit of that release. A release to the one was technically a release to both. The point was whether this agreement was or was not a release.

Lord Justice LINDLEY: There might have been an agreement, but it does not follow that it was a release.

Mr. WALTON: It is an agreement which the Corporation have acted upon, and under which they have given a sealed release to Hunter.

Lord Justice LOPES: There were two distinct causes of action—one against Lever, the other against Hunter.

Mr. WALTON: I feel that is the ground on which the Court below dismissed the action.

Lord Justice LOPES: What is the value of the release to Hunter, I cannot see.

Mr. WALTON: I think I shall satisfy you that satisfaction of one in a case where two are guiltily liable is satisfaction of both.

Lord Justice LOPES: Where is the joint liability?

Mr. WALTON: They acted jointly to defraud the Corporation; and if satisfaction is made in the case of one, the joint tort is satisfied. May I call your attention to the clauses of the agreement? You will see by the first clause that Hunter is to deposit forthwith, in the Lancashire and Yorkshire Bank at Manchester, securities which the bank shall guarantee are of the value of £10,000, in the name of the Mayor of Salford and Mr. J. C. Walker. Then the Corporation shall, at the request of Hunter, proceed against such former contractors, or at the instance of Hunter, institute further actions against such contractors, for the purpose of recovering any bribes or commissions received by him, or promised to be paid to him, by such contractors.

The MASTER of the ROLLS: What an outrageous thing! As trustees for Hunter, they are to sue the contractors. They could not recover a halfpenny if they sued as trustees. Here is an illegal, fraudulent, and criminal agreement between Hunter and these people —a conspiracy; and the Corporation, as trustees for Hunter, are going to sue his fellow-criminals. Upon a criminal contract, how could that be done?

Mr. WALTON: Then Hunter is to give such information and evidence as may be necessary for the purpose of such actions and proceedings; and he is also to pay all costs incidental to the proceedings. Any sums of money which may be recovered and received from such actions, or which may be paid to Hunter or to the Corporation by any contractors by way of settlement without action or after action brought (and as to the sufficiency of such sum Hunter shall be the sole judge) [The MASTER of the ROLLS: Bless my soul!] shall be paid over to, or retained by, the Corporation, and after deducting costs, the balance shall be taken in part satisfaction of the sum of £10,000; it being understood that the Corporation are to receive the clear amount of £10,000, irrespective of all costs and expenses, and no more. I would call your Lordships' attention to the expression "no more." On Dec. 31, 1889, in case the Corporation shall have been unsuccessful in recovering such sums, the said securities shall be realized, and the sum of £10,000 shall be paid over to the Corporation; and the said Hunter shall, in addition thereto, pay all costs and expenses incidental to such actions. Should, however, the Corporation succeed in recovering a sum less than the said £10,000, then the difference shall be made up from the realization of the securities, and the balance, after deducting all costs, paid over to Hunter. [The learned Counsel read the rest of the agreement.] Now, my Lord, as a matter of fact, in pursuance of that agreement a sum of £10,000 was duly deposited; and £4000 was recovered and applied under the agreement to Hunter's credit. Now, I submit that the agreement was a satisfaction of the claim of the Corporation against Hunter—that they could maintain no action against Hunter after that agreement had been entered into, assuming that Hunter performed it, and the evidence is that he did perform it. Therefore the cause of action against him is satisfied. Apart from the deposit of the securities, there was no obligation imposed on Hunter under the agreement; the rest was optional. He might instruct the Corporation to bring various actions for his own benefit.

The MASTER of the ROLLS: I do not understand it. The contractors—the dishonest coal merchants—have paid Hunter money. How could Hunter maintain an action against them for anything? And how could the Corporation sue them for Hunter?

Mr. WALTON: The Corporation had cause of action against the coal merchants; and the result of the agreement was that the Corporation resolved to exercise the cause of action in Hunter's interest and for Hunter's benefit.

The MASTER of the ROLLS: All they have done is that they have entered into an agreement with Hunter to maintain their own cause of action, and if they recovered under it, to pay it over to him. They are not suing in the cause of Hunter, but in their own.

Mr. WALTON: Yes; but the proceeds are to be applicable to the benefit of Hunter. So that the Corporation, if Hunter wished them to sue, were bound to sue; not otherwise.

The MASTER of the ROLLS: How could he prevent them? The only way he could prevent them suing, was to refuse to give evidence.

Mr. WALTON: Well, the proposition I submit is that this is an agreement operative in the discharge of Hunter in the action at the suit of the Corporation—it was a satisfaction.

Lord Justice LINDLEY: They had two causes of action against him, I suppose—one for the bribes, the other for fraud. Do you say they released him from both?

Mr. WALTON: Yes. The point I have to meet is this. They had against Hunter a cause of action for money had and received—that is, is, in respect of the bribes—which they had not against Lever; and therefore they were entitled to say they had set aside that cause of action against Hunter, and could yet maintain the action against Lever. But I maintain that it is immaterial to consider whether the

person rendering satisfaction was independently liable, if, as matter of fact, the satisfaction was ample for the loss sustained by the joint act of both tortfeasors. I submit that the Corporation have been satisfied by Hunter for their joint act. If it can be shown that the Corporation have taken satisfaction for the damage, either from Hunter or Lever, the other of them is not liable in an action to recover satisfaction for the same wrong.

Lord Justice LINDLEY: It is well settled that, if two persons commit a wrong, if you release the one you release the other.

Mr. HENN COLLINS said he did not dispute that.

Lord Justice LINDLEY: But before the action there was no release in law here, because there were only securities for £10,000 at the date of the bringing of the action.

Mr. WALTON admitted this; but said that, at the date of the defence, the time had expired during which the securities were securities, and the right to convert them had arisen. He then submitted that they could not have maintained an action against Hunter. They might have said: "If you pay us the £10,000, we will release you;" and then, until Hunter had paid the £10,000, they would have been out of Court, without satisfaction. His friend had relieved him from contending that, where there had been a joint tort and one of the persons had rendered satisfaction, that was an answer to a claim against the other; but he wished to draw attention to one or two very strong illustrations of that doctrine as applied to actions of trover. The learned Counsel proceeded to quote reported cases.

The MASTER of the ROLLS: Where is the agreement with the Corporation? You produce this paper; but it is not sealed or signed by them. Supposing they have not got the money, it is no agreement at all.

Mr. WALTON: The evidence shows that the Corporation have acted under the agreement. It shows that Hunter furnished the security, and the securities were deposited. I submit that, as between Hunter and the Corporation, the Corporation could not ignore the agreement. The Corporation, by part performance, are estopped from saying it is no agreement as against Hunter. They have taken Hunter's securities, and converted £2000 worth of them; and they received £4000 in bringing actions, at Hunter's request, under the agreement.

The MASTER of the ROLLS: How can you rely upon an agreement as binding the Corporation when it is not sealed?

Mr. WALTON replied that the Corporation had acted under it, and accepted the benefit of its performance by Hunter, on whom, he agreed, it was not binding. If their Lordships asked him how he supported the agreement, he submitted that it was binding as between the Corporation and Hunter, because the Corporation had acted upon it. It could not be said to be *ultra vires*, because the Corporation were entitled to deal with any person against whom they had claims for having defrauded them, and to make an arrangement with him in settlement of those claims. In the opinion of the Corporation, this was a fair arrangement to make. It could not be said to be *ultra vires;* and he urged that it was not against public policy.

The MASTER of the ROLLS: Is it not *ultra vires* for the Corporation to act as trustees for Hunter?

Mr. WALTON: It was the condition under which he agreed to pay the £10,000.

After some further questions by his Lordship,

Mr. WALTON said before the action came on for trial, under the provisions of the agreement, the bank was bound to realize the securities, and pay the money over to the Corporation; but in the meantime Hunter's liability had been reduced to £6000, owing to the fact that the Corporation had recovered £4000 from contractors, and this money was paid into the bank.

The MASTER of the ROLLS: The facts are that no money has been paid to the Corporation, and that the money was in the bank to an account in the names of the Mayor of Salford and Mr. Walker (Hunter's Solicitor). How anybody can for a moment suppose that that is a payment to the Corporation, I cannot understand.

Mr. WALTON: It was part of the agreement that the money should be dealt with in the way in which it has been dealt with. I submit that the agreement, fully performed, is a satisfaction of the cause of action.

The MASTER of the ROLLS: Your point now is that the Corporation have been satisfied by Hunter, and that this is a defence to Lever. Well, the first point is, Have the Corporation been satisfied by Hunter?

Mr. WALTON: We have the fact that the payment in of the money was intended to operate as a satisfaction of the claim of the Corporation against Hunter; and I submit that, if the claim against Hunter was satisfied, the claim against Lever was satisfied, even although Hunter was liable as a servant of the Corporation, and Lever was not liable in that character. This was established in the case of *Bird v. Rendell.*

The MASTER of the ROLLS said it was proved in that action, and before the trial, that the plaintiff had been paid. But in the present case there was no evidence that the Corporation had been paid.

Mr. WALTON: I submit that a right to payment may be met by payment, or it may be met without payment by an agreement. If it can be shown here that the Corporation got satisfaction——

Lord Justice LINDLEY: If you can show that they are getting satisfaction twice over.

Mr. WALTON: If we can show that the cause of action against the joint tortfeasor has been satisfied by any mode, either by actual payment or by agreement, the decision in that case would apply. [The learned Counsel went on to quote another reported case in support of his contention as to the nature of the agreement.] Proceeding with his argument, he said his client had paid Hunter £1500; and the Corporation were getting this £1500 back. There was a balance of £800. The Judge at the trial said the contractor had been guilty, with Hunter, of defrauding the Corporation, and they were entitled to recover the excess. Mr. Justice Day held that it was irrelevant to consider what agreement the Corporation had made with Hunter. The contention of his learned friend had gone the length that, if a man had two distinct causes of action, he was entitled to satisfy them separately. The learned Counsel went on to deal with the judgment of Mr. Justice Charles in the Court below, to the effect that the right of action against Lever was to recover the excess price he had received, and against Hunter to recover the bribe or commission, based on the well-known rule that no agent could make a profit for himself in any transaction conducted by him for his principal. It was the latter right which the Corporation had compounded for with Hunter; and the arrangement they had made with him could not be treated as payment or satisfaction for the tort Lever had committed. The learned Judge did not think the defendant could avail himself either as reducing the amount or as a bar to the action. This he (Counsel) submitted was opposed to the authorities to which he had called attention. Next he submitted that the jury were entitled to say whether the loss had not been reduced; and as to the £1500, that the Corporation were suing the defendant for it for the benefit of Hunter.

The MASTER of the ROLLS said, if the agreement was valid, and the Corporation had agreed to pay over to Hunter whatever money they recovered, there would be a right of action against them for breach of contract.

Mr. WALTON said the moment they showed that the action was maintained on behalf of Hunter, they had two answers to it—first, that the Corporation were *particeps criminis;* and, secondly, that, as to the £1500, Hunter would recover it twice over if he had the credit of the proceeds in this action. His instructions also were to move for a new trial of the case, on the ground that defendant was not present at the trial, and affidavits of medical men were put in that he was ill. But he (the learned Counsel) was in this dilemma—that he had no affidavits now, and the defendant was not in this country at present. Therefore he saw some difficulty in asking for a new trial on this latter ground.

Friday, Oct. 31.

The hearing of the case was resumed to-day.

Mr. HENN COLLINS, for the respondents, said, in supporting the decision of the Courts below, he had to submit that what passed between Hunter and the Corporation in nowise affected the rights of the Corporation against Lever. Hunter was the agent of the Corporation who received a bribe from Lever. Lever, on the other hand, had received from the Corporation, at the very least, 1s. a ton more than he ought to have had for his coal. This being so, the rights of the Corporation against Hunter were entirely irrespective of their rights against Lever to have their money in his hands refunded to them. If they had it refunded, they were nevertheless entitled, independently entirely of the demand against Lever, to the sums received by him in excess of what he should have had.

The MASTER of the ROLLS: But if he received 1s., and gave Hunter 6d, a ton?

Mr. COLLINS said if the agent, being in a fiduciary position, received a bribe, the other person could be sued for any money he might have put into his pocket consequent on that bribe. His point was that the Corporation could sue Lever for money had and received. He would at once proceed to quote the authorities on which he based his contention that the right of a principal against his agent did not rest on any confirmation of contract, but was entirely independent of the principal electing to confirm or disaffirm the contract which was induced by the fraud of the agent. If an action had been commenced against Lever, it would not debar the Corporation from suing for the bribe; the agent being personally incapacitated from holding the money of the principal. [The learned Counsel cited a case in support of his argument, in which some vendors were selling a property to a company. They entered into negotiations with some promoters, and agreed to give them a large slice of the purchase-money; but, on the face of the contract, there was to be no mention of this secret profit. The purchase-money was to be put down at a lump sum. The company was formed, the purchase-money paid, and the agreed amount handed over to the promoter. An action was afterwards brought by the company against both the vendor and the agent. The vendor compromised the matter by paying £31,000. They then turned round and said to their agent, "You have received money for commission." The agent said, "You can't get that from me; you have been paid damages by the vendor." "No," said the Court; "there is no relation between the two matters at all."] Assuming here that the action against Lever was one that could be framed for money had and received, and the Corporation brought their claim against Lever before they attacked Hunter at all, what answer was it to say, "I have paid money to your agent, which, if you like, you can recover?" Would that be an answer to a claim for money paid in excess of the sum which the Corporation ought to have paid. This could not be pleaded as payment by Lever. That being so, Lever could not pray it in aid in answer to the present application, because the Corporation had an entirely independent right against Hunter.

The MASTER of the ROLLS: I do not see it follows exactly. Because he must pay the whole, it does not follow that they can come and recover it over again.

Mr. COLLINS: But it is not "it." What they are suing for is money paid in excess. Suppose Lever had given a piece of plate. The action against Lever is for money paid in excess. What is his answer? "I have made a present of a piece of plate to your agent." How can that come into discussion?

The MASTER of the ROLLS: The question is, having recovered the money, how can you go against them?

Mr. COLLINS: Your Lordship sees that it is a mere accident here that the amounts are the same. I am not suing Lever for the same money. The bribe is a positive gift. My point is that I am not in any sense, as against Lever, seeking to recover the money that he has paid to Hunter. It is an entirely independent sum; he has received more money than he should have received.

Lord Justice LINDLEY: You say the fraud entitles you to more than the damages sustained by it?

Mr. COLLINS: Undoubtedly. It gives a right to damages against the contractor and right against the agents to recover the bribe.

The MASTER of the ROLLS: Suppose you have three agents who all combine. Can you recover the same damages against all three.

Mr. COLLINS said that he could only recover damages once. It was money received without consideration under the circumstances which arose. If he ever had received more than he was really entitled to, he was in a position to have an action brought against him; and the agent was in the position of having a bribe in his pocket. It was a

question whether or not the defendant had more money in his pocket than the plaintiff would have paid him. True, he would not have paid it to him but for the intervention of the agent; but the money being in his hands, he could not avoid paying it. The only defence he could suggest was that the amount could have been recovered from Hunter.

The MASTER of the ROLLS: They do not say so in this case. If you had done nothing but receive that, you could have recovered the whole from Lever.

Mr. COLLINS: Certainly; and if he had sued Lever first without having sued Hunter, he might have recovered from Hunter.

The MASTER of the ROLLS: Certainly.

Mr. COLLINS said he proposed to examine how far the agreement controlled his right at all. His learned friend had ingeniously mixed up (if he might say so without offence) the rights of the parties under the agreement. If their Lordships sifted it, he did not think they would have much difficulty in seeing that the agreement did not amount at all to a renunciation of their rights against either Hunter or Lever. To clear the position a little more before he analyzed the agreement to see what it was, he wanted first to ascertain what it must be to be of use to the other side. Certainly he was entitled to sue Lever for money had and received under the peculiar circumstances of the case. He had quantified the actual amount of money that he had received in excess of what he should have received, which was 1s. a ton; therefore he was in a position to maintain an action against Lever for money had and received. He had a separate and independent right against Lever, and against Lever alone, no matter what he had done with Hunter, unless there was a payment of some sort or a set-off.

The MASTER of the ROLLS said they could not recover against Lever without proving fraud.

Mr. COLLINS said he could recover if he had any admission from Lever that the money was in his hands without consideration; and they had an admission to a certain extent. If he could show a separate supervening cause of action against Lever alone, then he was entirely out of all the questions as to what the effect of the release was. If the action could be maintained as an action for money had and received, Hunter would not be a necessary party to it.

The MASTER of the ROLLS said he would not be a necessary party to either action. They might bring an action against Lever for fraud, and Hunter would not be a necessary party.

Mr. COLLINS said if it were a joint obligation of Lever and Hunter, it would be good; but what he submitted to their Lordships was that if he was entitled to maintain, as he submitted he was, an action, in the old days Hunter would not be a necessary party to an action for money had and received; and no contention could be urged on the ground that Hunter was not joined. There was a separate fraud with Lever, in respect of which the Corporation could sue, in the form of money had and received; and if he could maintain that action, all the talk about the effect of the release did not matter.

The MASTER of the ROLLS observed that, as against their agent, the Corporation were undoubtedly entitled to have back what he had received, or they might have an action against him for damages. If they proceeded against him in one of these actions, he thought there was one of the cases which said they could not proceed against him in the other.

Mr. COLLINS admitted that, if there was only one cause of action, and if he recovered either in contract or in tort, he could not sue on the other.

The MASTER of the ROLLS said he thought one of the cases said that, if they sued in point of fraud, they could not sue in point of damages.

Mr. COLLINS said there was no case which decided that. If he was damnified by what was done, he was not to lose his rights because the money had been received.

The MASTER of the ROLLS said they might then sue him and his confederates in tort, or they might sue either of them for what the Corporation had suffered from the fraud; and the question then arose as to what the effect would be of releasing one, supposing they might have proceeded against both.

Mr. COLLINS said if his right against Lever in this case were simply and solely by reason of a joint tort committed by him and Hunter, then, if he had either released Hunter or accepted satisfaction from Hunter, he should admit that he could not maintain an action against Lever. He did not want to take any false plea; but he wanted to clear the ground, and to see what was the case he had to meet. His first point was that there was arising out of this transaction a separate independent ground of action against Lever—that he could sue for money had and received, and that Hunter would not be a necessary party to the action. If he was right in saying that out of this transaction, some part of which was a common fraud, there arose a separate independent right against Lever and Lever only, then nothing in the document of release could come into operation to bar that right.

The MASTER of the ROLLS said that, as to the fraud, it did not depend upon the fiduciary relations, but on the fact that Hunter had been a party to the fraud. Otherwise, had not the Corporation an action against Hunter?

Mr. COLLINS said it was enough for him to say that there was a separate right in this case against Lever.

The MASTER of the ROLLS: That is as far as the fraud is concerned; but there is a joint action of fraud between him and Hunter.

Mr. COLLINS said he must put it higher than that. He maintained that he could sue one without suing the other. He was arguing the case on the footing that his only right of action was for a joint tort against Lever; that it was not necessary to join Hunter in it, but that the cause of action against them was joined.

The MASTER of the ROLLS said it should be argued on the footing that Mr. Collins had an action against either of them for a joint tort, and a separate action against Hunter for the bribe he had received.

Mr. COLLINS said he wanted to see what it was that it was enough to establish against him. If it was not enough to establish against him that he had covenanted not to sue one of two contractors, it followed that it was not enough that he had covenanted not to sue for a certain time, until something had happened to one of the contractors. He submitted that the true effect of the agreement was that there was not even an expressed contract with him not to sue Hunter, but only an implied contract not to sue Hunter for a certain time, and a provision that during the whole of that time his client's rights should be preserved intact against the joint tortfeasor, and pending that time his client's rights should be against Hunter. He went on to point out the nature of the deposit of securities on behalf of Hunter, and that there was no contract not to sue him.

The MASTER of the ROLLS said the Corporation might have a right of compromise; but he did not like the general tendency of the case, and especially that part of it which provided for the return to Hunter of the money they might recover, at the expense of the ratepayers, against the coal dealers. He was very much inclined to agree with Mr. Justice Vaughan Williams that this was a most immoral arrangement. Perhaps it was not so intended by the Corporation; but the agreement might lead Hunter to lie and perjure himself, as he had already done, against the coal-owners.

Mr. COLLINS said it was fair to remember that the Corporation had reason to believe they had been defrauded of a considerable amount, as to which Hunter was the single person who could give them any information.

The MASTER of the ROLLS said he had no sympathy with the coal-owners; and he could not conceal from himself that Hunter must have been making a good thing out of the business, and perhaps when he came out of gaol he would be comfortably off.

Mr. COLLINS said he did not deny that it might be so; but the Corporation had to make the best bargain they could in respect to the rights of those they represented. They, therefore, induced Hunter to begin with this deposit, and, so far as they could, to agree to enable them to have no more dealings with these contractors, whose names it was very important for them to learn.

The MASTER of the ROLLS: Do it before the trial, and you would be guilty of felony; but do it after the trial, and you are quite right. That is the long and short of it. I do not like it.

Mr. COLLINS said he did not propose to argue the question of *ultra vires*.

The MASTER of the ROLLS: I do not care whether you argue it or not; I know I shall act upon it.

Mr. COLLINS said he would content himself, in his final words, with saying that he argued in support of the judgment independently of that ground; and he thought the authorities he had cited were consistent with that view.

Mr. GOULD having made a few remarks following the contention of his leader,

Mr. WALTON, replying, urged that the Corporation had not in any way framed their action in the way Mr. Collins had put it. The cases as to the rights of the matter with regard to the servant did not apply. The plaintiffs here must show that they had suffered loss. His friend said, if they could show that the Corporation had gone to Hunter and obtained from him £1500 which Lever had paid him, they could still get it from Lever. So that, although they had sustained no damages at all, and had recovered the money paid to Hunter, they could still maintain their action.

At the close of the learned Counsel's argument, the Court rose.

Saturday, Nov. 1.

Their Lordships gave judgment this morning.

The MASTER of the ROLLS said that the claim of the Corporation against the defendant was founded on fraud. What was that fraud? The defendant had coals to sell, and his duty was to make a bargain through an agent of the Corporation, who was a man of position, to sell coals to them. He knew that the agent's duty was to buy coals at any price at which the defendant chose to sell them. There was no obligation on the defendant to sell coals at the market price. He agreed with Hunter for a fair price for the coals, which left a fair profit. Hunter, however, tempted him by saying that he would not buy his coals at his price unless he helped him to cheat the Corporation out of 1s. per ton. It was agreed between them that Lever should charge the Corporation 1s. per ton more than the proper price, and should hand over that amount to Hunter. It was to be called a "commission." The word "commission" often covered a multitude of sins; and in this case it covered a fraud. The defendant's fraud was, therefore, in allowing and assisting Hunter to cheat the Corporation. He got the money—the 1s. per ton—into his hands by a fraud; and therefore he was bound to pay it over to the Corporation. The damage the Corporation had suffered was the 1s. per ton out of which they had been cheated. The form of action was wholly immaterial; and, although the defendant had paid over the money to his confederate, Hunter, it had at one time been in his hands, and therefore he was liable for it to the Corporation. He was no doubt tempted to commit the fraud by a man holding the powerful position Hunter held; but this, of course, did not excuse the fraud. The defendant contended that the Corporation were prevented from maintaining the action because the money went into the hands of the Corporation's agent, Hunter; and they had recovered it from him, and therefore could not recover it a second time from the defendant. Hunter, it was true, had received a bribe. There was nothing in business more dangerous and more fraudulent than for an agent to receive a bribe; and therefore the law had struck at this practice, and had said that if an agent took a bribe in respect of his agency, he must hand over that bribe to his principal. Of course, an agent might receive a bribe or a commission without any fraudulent intention on the part of the person bestowing it. Whatever the thing was called—whether a bribe or a commission—the foundation of the Corporation's action against Hunter was the separate and distinct fraud on them by him. That, therefore, did not in any way prevent them from suing the defendant for giving the bribe to Hunter. It was no defence for him to say that they had already sued Hunter. It made no difference which of them was sued first. The two frauds were absolutely separate and distinct. The defendant, therefore, could not absolve himself because the Corporation had already recovered the amount from Hunter. But the defendant further contended that the Corporation had entered into an agreement which prevented them from suing him in respect of the combined fraud of himself and Hunter It was a well-established principle of law that where there were two tortfeasors, and the injured party released one of them from his

liability, he must be taken to have released both. What, then, was this agreement on which the defendant relied? The Corporation did not wish to take the point that the agreement was not binding upon them. He (the Master of the Rolls) did not feel satisfied that the Court ought not, however, to take that objection themselves. Whether the Corporation took the objection or not, the agreement did not bind them. It was not sealed with their seal, and therefore had no binding effect. But even if there were a binding agreement to the effect on which the defendant relied—viz., an agreement by the Corporation with Hunter to bring actions at Hunter's request and at his expense—this did not amount to such a compromise and release of Hunter as to release the defendant from his liability. The Corporation by the agreement must bring actions at the request of Hunter. If these actions failed, the Corporation would be primarily liable for the costs. No doubt there was a provision in the agreement for obtaining the costs from Hunter; but they would be primarily liable. Under these circumstances, he (the Master of the Rolls), for his own part, thought the agreement was wholly *ultra vires*, and that the Corporation had no mandate from the burgesses to agree to it. Therefore, if the agreement was *ultra vires*, it had no effect. But even if it were not *ultra vires*, it certainly was not a release of Hunter. It merely suspended the action of the Corporation against him, and left it perfectly open to them to sue him afterwards. It was merely a postponement of the Corporation's right of action against him; and this could not prevent them from suing the defendant. Therefore the defendant's defence altogether failed, and he was liable to the plaintiffs for the sum claimed. The result, no doubt, was to enable the Corporation to do that to which he (the Master of the Rolls) had the strongest possible objection. If they could get the £10,000 from the defendant and other coal merchants who had been tempted by Hunter, they might ruin them; but Hunter himself, when he came out of prison, would go scot-free, except for the money already recovered from him, and would receive back his securities untouched, and thus would reap the plunder of his gross and wicked fraud, while the people whom he had tempted would have to suffer. Nevertheless, this was the law; and therefore the decision of the Divisional Court must be upheld.

Lord Justice LINDLEY agreed. Apart from the agreement, the action seemed to him to be an undefended one. The sole defence was the agreement. At the time this was entered into, the Corporation had discovered the facts of the case; but they had not recovered any of the money out of which they had been swindled. They were bound, therefore, in the interests of the ratepayers, to consider how to recover it. Whether they could have got it back from Hunter alone was by no means certain; but they certainly could not recover it from the coal merchants without Hunter's assistance; and, under these circumstances, they came to this agreement with Hunter. He (Lord Justice Lindley) was not prepared to say that it was, under the circumstances, an illegal bargain or *ultra vires* on the part of the Corporation. Considering its scope and object, he thought it was neither illegal nor *ultra vires*. It was not under seal, and therefore not binding on the Corporation; but it had been treated all through as an arrangement by which the Corporation were content to abide. The agreement had absolutely no effect on the right of the Corporation against the defendant. Hunter was bound to pay over to them the bribe he had received, without taking into consideration anything the Corporation might recover from the coal merchants. It would be paradoxical if the position of the Corporation depended upon whom they sued first. It did not lie in the mouth of the defendant, who was a wrongdoer, to say that his liability was diminished by what the Corporation had recovered from Hunter. There was no method by which the defendant could use the agreement unless he could say that in substance, though not in form, it was an action by Hunter against him—by one thief against another, to recover a share of the plunder. When the real facts were ascertained, it became plain that the action was nothing of the kind, but was one by a defrauded principal against an agent. The Court below had therefore come to a right conclusion.

Lord Justice LOPES said he did not desire to express an opinion as to whether or not the agreement was *ultra vires* or illegal; nor was he prepared to say that the Corporation had acted improperly in entering into it. Assuming the agreement to be good and valid, it had nothing to do with the present action. He did not think it was even admissible in evidence. It was neither a release nor an accord and satisfaction. Apart from the agreement, the defendant had no answer to the action. The present action and that against Hunter were entirely separate and independent of each other. The one was brought for excess of price obtained by the defendant's fraud; the other was for Hunter's fraud in taking bribes. If the bribe had consisted of a piece of plate instead of a commission, there would have been no doubt. The Corporation could first sue Hunter, and then the defendant.

The appeal was therefore dismissed, with costs.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, Oct. 28.

(*Before Justices* DAY *and* LAWRANCE.)

The Mayor, &c., of the City of Manchester v. Williams.—Action for Libel.

This case came before their Lordships to-day, sitting as a Divisional Court.

Dr. BLAKE ODGERS appeared for the plaintiffs; Mr. C. A. RUSSELL for the defendant.

Mr. RUSSELL, in opening the case, said this was a proceeding in the nature of a demurrer to a statement of claim. The action was by the Mayor and Aldermen of the city of Manchester for libel; and the objections in point of law which he appeared to support were: (1) That the alleged words were not capable of being construed into a libel against the Corporation; and (2) that the statement of claim disclosed no cause of action—a municipal corporation being unable to sue as a corporate body in respect of the words complained of. The libel complained of was published in the *Manchester Examiner and Times*, and was as follows:—

SIR,—Manchester has lately been pitying poor Salford, and has exhibited much cheap sympathy or contempt for that misgoverned and much degraded royal borough. Let Manchester look at home before it throws mud across the Irwell. Some years ago I felt it my duty to write for one of your contemporaries some half dozen articles dealing with the City Council's scandalous and abominable expenditure of about £110,000 upon "our" Victoria Hotel. The great bulk of our Council were until then in woeful and pitiable ignorance of the whole business. That investigation brought some strange occurrences (not yet revealed by me) to my knowledge. I received visits from several gentlemen of high standing among us who confided to me facts that dumbfounded me, and which showed that the citizens lost large sums of money by the lax way in which the job was managed, and that bribery and corruption prevailed to a very great extent. Let me express the hope that the Commission which Salford is asking for may be extended so as to include Manchester; and if it possesses statutory power to send for persons and papers, I will undertake to bring before it witnesses and documents who will (and I deeply deplore it) prove that in the case of two, if not three, departments of our Manchester City Council, bribery and corruption have existed and done their nefarious work.—Yours &c.,

SAMUEL NORBURY WILLIAMS.

Justice DAY: How if damages were awarded, would they be appropriated?

Mr. RUSSELL: I do not know.

Justice DAY: Would they go in aid of the rates?

Mr. RUSSELL: I presume so. Continuing, the learned Counsel said the innuendo was that bribery and corruption existed, and had existed in three departments of the city.

Justice DAY: I fail to see how a corporation can be corrupt.

Mr. RUSSELL: The same view was expressed by Chief Baron Pollock in the case of the Metropolitan Saloon Omnibus Company. A corporation cannot in its corporate capacity bring an action against an individual. The charges of the defendant were not against the Corporation as a body, but had reference to certain departments; and in any event a corporation could not be charged with bribery and corruption, because, as a corporation, they could not be guilty of it.

Dr. BLAKE ODGERS said the letter in question appeared at a time when there was great trouble in Salford; one of the Corporation officials having been found guilty of receiving bribes to a large extent from a coal contractor who supplied coal to the gas department of the Corporation. The letter, as he submitted, was not a fair comment on the way in which the Corporation of Manchester managed their affairs. It was a direct and positive assertion by Mr. Williams that at Manchester the same sort of thing went on that was going on in the neighbouring borough of Salford. This was not a mere flash in the pan; but it was a distinct definite statement that Mr. Williams had had confided to him certain facts, which not only showed that the citizens had lost a large sum of money by the lax management of the Corporation, but, further, that in three departments at least, bribery and corruption were being carried on to a great extent. He also spoke about being able to produce witnesses and documents; but he had not done so. The Corporation were only anxious for him to produce these documents and witnesses; but instead of allowing them to test the truth of his statement, Mr. Williams was endeavouring to prevent the Corporation going before a jury by taking this technical point. He submitted that the Corporation were the right plaintiffs in the matter. If not, what it came to was this, that any one in any borough of England might write a letter in the same terms stating that bribery and corruption were going on in the Corporation to a regrettable extent, without fear of any proceedings being taken, civil or criminal. Public life under these circumstances would become intolerable.

Justice DAY: A corporation may possibly make use of the name of the Crown to put an end to a libel which tends to disturb the public peace, although they may not be at liberty to institute civil proceedings with a claim for damages. That is another consideration.

Dr. ODGERS said that in every criminal proceeding for libel it was necessary that the prosecutor should show that the libel applied directly to himself. Here the case was different. No member of the Corporation could show that the words applied directly to himself; and, he submitted, there could be no prosecution on this letter except by the Corporation as a body. It was common ground that a corporation could sue and be sued; and he urged that they could bring an action for libel in respect of words which affected them as much as an ordinary person. There were, of course, exceptions by reason of the fact that a corporation had no physical existence; and, as an instance, no action could be brought for assault because there was nobody to assault. He, however, contended that, in the present instance, the Corporation, were entitled to sue, and that the defendant in writing the letter he did, had not confined himself to a *bonâ fide* comment.

Without calling upon Mr. Russell to reply,

Justice DAY said he was surprised that a great Corporation had condescended to bring any such action. The action was brought in respect of an alleged libel contained in a letter written to a newspaper by the defendant, whoever he might be; and the only question to be considered was whether such an action could be maintained. It was utterly unprecedented; and it seemed to him to be without any principle whatever. The law with reference to actions of this description brought by corporations was quite sufficient; and the limits were well suggested. In the case to which attention had been called—the Metropolitan Saloon Omnibus Company—while it did not come within any class of actions for libel brought by corporations, it did fall within the principle of the class of actions which Chief Baron Pollock held could not be maintained. It was idle to suppose that such a statement imputing corruption and mismanagement to individual officials, would be ground of action by a corporation such as the present plaintiffs. He was clearly of opinion that the action could not be maintained; and judgment would be for the defendant with costs.

Justice LAWRANCE concurred.

Wednesday, Oct. 29.

(*Before Mr. Justice* CHARLES.)

Wilson v. "Financial Times," Limited.—The Liquidation of the Nottingham and Derby Water Gas Company.

This was an action brought to recover damages for an alleged libel; the plaintiff being a tea merchant carrying on business in Bush Lane, E.C., and defendants the proprietors of the *Financial Times*.

Mr. JELF, Q.C., and Mr. BLAKE ODGERS appeared for the plaintiff; Sir C. RUSSELL, Q.C., and Mr. WITT for the defendants.

The plaintiff was a shareholder in the Nottingham and Derby Water Gas Company, Limited, and purchased his holding—100 shares—in

the open market at a premium. It appeared that on the 14th of November, 1889, resolutions were duly passed by the Company for voluntary liquidation; and the plaintiff was elected to act as voluntary liquidator in conjunction with three of the Directors—Messrs. Goldschmidt, Cox, and M'Craith. On the 23rd of November, 1889, the following paragraph appeared in the defendant's paper:—

All this hurry and anxiety has set people thinking. Can it be that any or all of the four gentlemen who got themselves appointed as liquidators have an interest in the liquidation? We ask this in a grave spirit, and will go so far as to say that if it is of the "utmost importance" for any shareholder to be present at the meeting on the 30th, it should be as an opponent to the winding-up resolution. . . . . In City ethics, philanthropy is said to inhabit a man's purse; and in this instance, although we do not say it is so, it is possible that smart business men may be making a "pile" for themselves at the expense of the shareholders they are pretending to befriend.

A motion was then made by the British Water Gas Syndicate, who claimed to be creditors of the Company, in the Chancery Division, before Mr. Justice Stirling, to restrain the shareholders of the Company from confirming their resolution for the voluntary liquidation; and in the course of these proceedings it transpired that two of the plaintiff's co-liquidators—Messrs. Goldschmidt and Cox—had accepted from Messrs. Cottam and Fox, the promoters of the Company, shares in the British Water Gas Syndicate at par, which they had very shortly afterwards sold at a premium. The motion, however, was dismissed, though Mr. Justice Stirling commented severely on the conduct of Messrs. Goldschmidt and Cox, in consciously or unconsciously having permitted themselves to receive a bribe from the promoters and from Mr. Cottam, but did not in any way refer to or mention the plaintiff. On Nov. 28, 1889, the defendants published an article quoting the words used by Mr. Justice Stirling which condemned the conduct of Messrs. Goldschmidt and Cox; but the article did not mention or refer to the conduct of Mr. Cottam in offering the bribe. On Nov. 30 the resolutions for voluntary liquidation, and for the appointment of the plaintiff as voluntary liquidator, were confirmed at an extraordinary general meeting of the Company. On Dec. 3 the following paragraph appeared in the defendants' paper:—

Mr. Wilson, who spoke at the Notts and Derby Water Gas Company's meeting on Saturday in defence of Messrs. Goldschmidt and Cox, proved himself to be the right man in the right place. We congratulate Messrs. Goldschmidt and Cox on an advocate so well adapted by nature to defend such conduct as theirs. Mr. Wilson alleged that the *Financial Times*, while publishing what the Judge said about the Directors, refrained from stating what his Lordship said in reference to Cottam and Fox. Any one who will turn to our issue of Wednesday last will see this is a deliberate untruth.

The plaintiff alleged that the innuendo contained in this last paragraph was that he had also been bribed by the promoters and had acted in collusion with Messrs. Goldschmidt and Cox. On Dec. 6 the defendants published the following article:—

Mr. Edward Goldschmidt must be credited with the courage of his purse. He is evidently determined to fight to the last gasp in defence of his statutory right to make money by peculiar methods. . . . On behalf of his co-liquidators and himself, Mr. Goldschmidt pretends to have but "one object in view—the interests of the general body of shareholders." Had he said half-crown shareholders instead, we should have been entirely at one with him; for the purchasers of shares at nominal prices will gain most by the Company being liquidated. Again, this very philanthropic Chairman (who seemingly desires nothing better than to lay down his sceptre in exchange for substantial gold) remarks, "We have fought for the shareholders in the past." For how long and for what shareholders? we should like to know. For Messrs. Goldschmidt and Co. and the other purchasers of cheap shares? . . . Accompanying his circular, Mr. Goldschmidt sent a blank form to be signed by shareholders expressing their confidence in the liquidators; but if shareholders take any notice of this document, they should return it filled up as follows:—"I, ———— of ————, a holder of —— shares, hereby refuse to support Messrs. Goldschmidt, Cox, and Wilson, three of the liquidators appointed against the advice of Justice Stirling, and express my belief that, if the Court allows them to remain as liquidators, they will carefully look after their own interests."

The plaintiff alleged that the innuendoes contained in this article were that he was anxious to act as liquidator from interested motives; that it was his design to defraud the shareholders; and that he was in league with Messrs. Goldschmidt and Cox, and had accepted shares in the Syndicate, as they had done, and had made a profit out of such transactions, &c. The defendants pleaded that the articles of Nov. 13 and Dec. 6, 1889, did not refer to the plaintiff; that the contents of the article of Dec. 3, 1889, were true in substance and fact; and generally that the words complained of were fair and reasonable comment on the plaintiff's conduct in accepting the office of liquidator in conjunction with Goldschmidt and Cox, and were incapable of bearing the construction put upon them by the plaintiff.

Plaintiff having given evidence, upon which he was cross-examined by Sir C. RUSSELL,

Mr. WITT submitted, on behalf of the defendants, that the true conclusion to be arrived at, from reading the articles complained of, was that they meant, in substance, that the plaintiff having known of the accusations levelled against Goldschmidt and Cox, ought not to have associated himself with them in the liquidation. He also commented at length on the articles themselves.

Mr. JELF having replied,

His LORDSHIP, after recapitulating the facts, said he had come to the conclusion that all the publications complained of contained defamatory matter, and were not fair comment, inasmuch as they contained untrue statements of fact. He thought it was pretty clear that the case had been tried with the sole view of getting before the public the dealings of Messrs. Cox and Goldschmidt with respect to the Company's shares. He considered that Mr. Wilson was entirely free from the imputations cast upon Messrs. Cox and Goldschmidt, and was not in any way implicated with their practices. He was appointed liquidator much against his will; and his appointment had been confirmed by Mr. Justice Stirling. No imputation was made by the learned Judge upon the plaintiff; and, indeed, there could not be, for the mere fact of being associated with the other gentlemen did not affect his personal honour. After dealing *seriatim* with the articles complained of, he said he thought the justice of the case would be met by giving the plaintiff £50 damages, with costs.

MIDDLESEX ASSESSMENT SESSIONS.—Guildhall, Westminster Friday, Oct. 31.

(*Before Mr.* R. D. M. LITTLER, Q.C., *Chairman, and a Bench of Magistrates.*)

The Assessment of the North Middlesex Gas Company.

To-day the appeal of the North Middlesex Gas Company against the rate made upon them by the Assessment Committee of the Barnet Union for their gas mains and pipes in the parish of Finchley was heard.

Mr. POLAND, Q.C., and Mr. FOXALL appeared for the Company; Mr. BALFOUR BROWNE, Q.C., and Mr. PAGE for the Union.

Mr. POLAND, in opening the case, said the Union assessed the gross value of the mains and pipes in the parish of Finchley at £1903, and the rateable value at £1250. The property of the Company was in Hendon and Finchley; the works being in the former. It was a large, straggling district. From 1884 until now, the rateable value had been taken at £759. During that time the Company had complained to the Committee about the rate, but had not hitherto gone to the expense of an appeal. Now, however, this course had become necessary. In 1884, when the rateable value was put at £759, the profits of the Company were £3939. In 1889 the profits had sunk to £3692; the expenditure, including repairs, being £3823. The new rate was based upon the accounts of 1889; but in March of that year, the Company had to reduce the price of gas, owing to the cheapness of oil, from 4s. 6d. to 4s. 3d. per 1000 cubic feet—the price in 1884 being 5s. There had been an increase in the cost of coal since last June, when an old contract expired, from 14s. 9d. to 17s. 8d. per ton; and further—and this was a very serious question—there was an advance in the price of labour. The contention of the Company was that the rateable value of the whole undertaking was £1424, of which £340 should be allocated to Finchley.

Mr. *J. Cash*, Assoc. M. Inst. C.E., the Engineer and Manager of the Brighton and Hove Gas Company, said he had examined the works of the appellant Company, and found them to be of very good construction, and suitable in every way for manufacturing gas at moderate prices. He put the rateable value in Finchley at £340. The profits of the Company were decreasing every year. In 1886 they were £4716; in 1887, £3990; in 1888, £4087; and last year, £3692. He anticipated that they would drop still further, owing to the increased cost of coal and labour.

Cross-examined by Mr. BALFOUR BROWNE: The falling off in the profits was partly due to the reduction in the price of gas. There had been no decrease in the consumption. He believed the Company had done their best to push the gas-stove business. Taking into account the competition between gas and oil, it was probably a prudent thing on their part to reduce the price. His own Company lowered their price in January last; and the consumption had gone up in consequence. The total expenditure, according to the balance-sheet, was £8231. Deducting from this the amount of rates and taxes which were charged, then correcting the amount by adding the rates and taxes according to the rateable value he was proving, and putting on £25 for law expenses, the total expenditure was thus brought up to £8100. He had put down £963 for repairs and renewals in the works themselves, and £629 for keeping them structurally in a proper condition. He had allowed £300 for Directors' fees. He considered this was a moderate amount, even though there were the salaries of a Secretary and a Manager in addition. The arrears, which were chiefly due to the large amount owing for residual products, were unusually heavy in the case of this Company; being upwards of 25 per cent. A new tenant would require working capital for six months; and, deducting £2280 for *ad interim* receipts, he (witness) put down £4603 as the actual amount that would be required. He had placed the occupier's share at 17½ per cent., which was made up according to the usual practice—5 per cent. on the tenant's capital of £6883, 10 per cent. trade profits thereon, and 2½ per cent. for risks and casualties. He believed the Company had been paying their maximum statutory dividend of 10 per cent. They had a reserve fund of £3882. The difference in the price of coal between 14s. 9d. and 17s. 8d. per ton, was 2s. 11d.; but from this he deducted 9d. for the enhanced value of the residual products. He knew that the price of coal went up early in July last. The chief item of increase in the residuals was coke; there had been but a very slight rise in the value of tar. The sales of tar last year amounted to £210; and of coke to £1536. The additional cost of labour in these works was between 5 and 6 per cent. per man. The consumption of gas in the district seemed to be almost at a standstill. He put down £76 for insurance; being 10 per cent. upon the insurable portion of the plant and buildings. He valued the lands and works at £22,662. There were 70 retorts of which number he thought 48 were in use; but for emergencies he would require 10 more at least. Upon this calculation, the Company had 12 more retorts than necessary. Small works, however, required a greater proportionate number of retorts than large works.

Re-examined by Mr. POLAND. The reserve fund had to be drawn upon to pay the last dividend; the profits being £3692, and the amount required for dividends £3753.

Mr. *E. Ryde*, examined by Mr. POLAND, stated that coal cost the Company last year £3912. To this sum he added £773, representing the increased price of 2s. 11d. per ton upon 5298 tons—the quantity carbonized in the year. This brought the cost of coal to the hypothetical tenant up to £4685, to which he added £197 for purifying materials; making altogether £4882. The residual products (allowing 10 per cent. for the increased price of coke) he estimated would return £1934; and this sum, deducted from the £4882, brought the net cost of coal and purifying materials down to £2948. The wages last year were £1091. Allowing for an increase of 20 per cent., that figure was raised to £1300. Directors' allowances, law charges, rates and taxes, and miscellaneous items, brought the estimated expenses to £6473; and this deducted from £10,083, the estimated gross receipts, left £3610 net. He took the tenant's capital at £7000, and allowed thereon the usual 17½ per cent., which came to £1225. This deducted from the net receipts, £3610, left £2385, from which he then took £988 for the statutable deductions, leaving £1397 as the rateable value.

He valued the station at Hendon at £800 per annum (4 per cent. on £20,000), and the mains in that parish at £217. This left £380 as the rateable value of the property in Finchley.

Cross-examined by Mr. BALFOUR BROWNE: It was quite true that the Company had the advantage of the old contract for coal at 14s. 9d.; but the hypothetical tenant would not have this benefit. He believed the 20 per cent. he had allowed for the increased cost of labour was below what experience suggested. The hypothetical tenant would, with the labour question in its present state, make a very much larger allowance than 20 per cent.

Mr. *H. E. Jones*, M. Inst. C.E., Engineer of the Commercial Gas Company, said he put the hypothetical tenant's capital at £7600; and he estimated the structural value of the works at £21,221. He put down £300 as the rateable value of the mains in Finchley. The district was a very straggling one; and the whole nature of the Company's business involved a good deal of what he called non-productive capital. His own Company had not dared to raise the price of gas; oil was too cheap. The Companies about London were paying 50 per cent.—not 20 per cent.—increase in wages.

Mr. *W. H. Hardy*, the Company's Accountant, said they employed 19 workmen—12 stokers, 5 yardmen, and 2 district men—who had had an increase in wages of 1s. per week each.

Mr. BALFOUR BROWNE then addressed the Court on behalf of the respondents. He contended that the Directors' fees should be deducted, on the ground that the directors of a gas company could not render such services as the directors of a railway or a dock company, and that their duties were not so much to manage the affair as to earn the landlord's rent. He made out the whole management expenses of the works to be £725, which was an ample amount having regard to the receipts. A tenant would only require a working capital for four months and a half—not for six months, as the appellants suggested. This capital would amount to £4895, upon which they allowed 16½, not 17½ per cent. Unlike a railway company, a gas company required but a small amount of capital; and 16½ per cent. on the figure he suggested, or on the £7000 suggested by the other side, was ample.

Mr. *C. Jones*, Surveyor, said he had valued many gas-works in the neighbourhood of London and elsewhere for rating purposes; and this was the only appeal against his valuations. The figure of £759 adopted in 1884 was his valuation. The dividend was higher by £15 in 1889 than in 1888; and the output of gas was greater. In 1889 there was a decreased expenditure of £68, and diminished receipts to the amount of £39; so that the concern was £29 better than in 1888. He contended that the 2s. 11d. per ton increase in the price of coal ought not to be spread over the entire year, because it only dated from the 1st of July, and the year ended at Michaelmas. The actual advance in wages had only been £20; whereas Mr. Hardy's figures worked out to more than £40. Further, the increase only existed during nine months out of the twelve. The Company's Manager had told him that it really only affected the head stoker, who received 2s. 6d. extra per week, and five other men, who received 1s. 6d. each per week.

The CHAIRMAN said the proposed rate came to 10d. per 1000 cubic feet of gas sold. Did the witness know of any instance in the world where so high a rate was paid?

Witness replied that he had not worked out the figures, and did not know whether the rate amounted to 4d. or 10d. per 1000 cubic feet; but, at all events, the net profits would be upwards of £800 on a capital of £5000. Upon the latter figure he had allowed 16½ per cent., which he considered reasonable, as the £5000 included the stores of coal and coke, and a balance of £500 at the bank. He based the statutory deductions on the annual average for the last seven years of money expended in renewals. He allowed £50 for insurance. The structural value of the works at Hendon had been estimated by Mr. Silverthorne at £15,000. Of the 70 retorts on the works, he was told that only 42 were used in mid-winter; but he agreed that two benches of five each should be allowed as a reserve. This showed that the Company had 18 retorts in excess of their probable needs. He therefore deducted about one-fourth from the £15,000; leaving roughly £12,000 as the structural value for present needs. The rateable value of the whole concern, including rates, was £3774. The rateable value of the works at Hendon was £655, which left a balance of £3119, equalling 30¾ per cent. of the gas and meter rental over the entire undertaking. This applied to the receipts in Finchley, after deducting £500 for rates, gave £1482 as the rateable value for that parish.

In cross-examination, witness said he assumed in his calculations that the tenant would get the benefit of the old price of coal, as the advance was not made until the early part of this year. He had previously eliminated directors' fees in the case of all the gas-works he had valued, except those of The Gaslight and Coke Company. He was ready to split the difference between the 16½ and 17½ per cent.

Mr. *W. Eve*, Surveyor, said that after deducting the rates, which were exceptionally high, he estimated the rateable value of the mains and and pipes in Finchley at £1231.

Mr. *A. Silverthorne* said he put the rateable value of the Company's property in Finchley at £1330. He calculated that the rates and taxes last year came to 3·95d., not 10d., per 1000 cubic feet.

After deliberating in private for a short time,

The CHAIRMAN said: We have given the best attention we can to this matter, and have come to the conclusion that the appeal must be allowed. The rate must be amended by reducing the gross estimated rental to £456. The rateable value is accurately £378 14s.; but as, of course, you do not want odd shillings, we take the nearest pound. The rateable value is therefore reduced to £379. The appellants succeeding, they have the costs of the appeal.

[On Saturday it was announced by the Deputy-Chairman that, in giving the decision on the previous day, Mr. Littler had inadvertently stated the gross estimated rental to be £456, instead of £556.]

Saturday, Nov. 1.

(*Before* Mr. R. LOVELAND LOVELAND, *Deputy-Chairman, and a Bench of Magistrates.*)

The Assessment of the Colney Hatch Gas Company.

To-day the Court was occupied with an appeal from the Colney Hatch Gas Company against a rate levied upon them by the Assessment Committee of the Barnet Union, for their property in the parish of Friern Barnet.

Mr. POLAND, Q.C., and Mr. FOXALL appeared for the Company; Mr. BALFOUR BROWN, Q.C., and Mr. PAGE for the Committee.

Mr. POLAND, in opening the case, said the rate appealed against was £509 gross, and £339 net rateable value. The works were in the parish of Edmonton; and the Company supplied four parishes. In 1884 the rateable value of the mains in Friern Barnet was £100; but in that year it was raised to £339. In May, 1890, the parochial authorities gave notice of their intention to raise the rateable value to £398. The Company attended before the Assessment Committee, who reduced the £398 to the old sum of £339. But the inquiries which this proceeding induced the Company to make, showed that the old figure was too high; hence the present appeal. Two very important questions to be considered were the increased price of coal and the higher cost of labour. The former, on the expiration of an old contract on June 30, 1890, had risen from 13s. 9d. for screened, to 17s. 2d. for unscreened coal. The Company had been compelled to reduce the price of gas, owing to the competition of mineral oil; and this was an important consideration in a district largely consisting of small houses. The present price was 4s. 4d. per 1000 cubic feet. In 1874, the Company had power to charge 5s. In that year there was an explosion, and they had to raise fresh capital; and parliamentary powers were obtained to increase the price to 6s.

Mr. *J. Cash*, the Engineer and Manager of the Brighton and Hove Gas Company, said that from an examination of the works and accounts, he considered that the rateable value of the whole undertaking was £973. The property in Friern Barnet consisted of mains only. He put the total income at £9463, and the expenditure at £6045. In the latter total, he included fees paid to the Directors. These figures gave a profit of £3418. The occupier's share for working capital, meters, and utensils he estimated would amount to £7189. The usual 17½ per cent. on this (£1258) reduced the profit to £2160. The tenant must be provided with six months' capital; but he would be receiving from time to time sums which would reduce the amount. He estimated the statutable deductions at £755, which brought down the total rateable value, as shown by last year's accounts, to £1405. From this sum he made a further deduction of £445, at the rate of 2s. 5d. per ton of coal carbonized; this figure representing the difference in the cost of coal, less 1s. per ton for the enhanced value of residual products. He then deducted £113, representing 20 per cent. additional cost of labour. Then making the corrections for the reduced rateable value, he suggested the net deduction became £432. This amount deducted from the £1405, showed the rateable value of the entire undertaking to be £973. This figure he apportioned as follows: Works, £635; mains and services, £338. Of the latter sum, he apportioned £88 for the mains in Friern Barnet. The rate proposed by the Committee represented 4·34d. per 1000 cubic feet, which was higher than in the case of any Company in the Metropolitan district. The profits in 1885 were £3418; in 1886, £3277; in 1887, £3380; in 1888, £3524; in 1889, £3264. The quantity of gas supplied in 1881 was between 21 and 22 million cubic feet; the price being 5s. 9d. for one half year, and 5s. 6d. for the other. In 1889, 35 million cubic feet of gas were supplied.

Mr. *E. Ryde* said the total receipts of the Company for the year 1889, less £133 for the reduced price of gas, were £7872. The first cost of coal, allowing £628 for the increased cost, and £188 for purifying materials, he put down at £3555. From this he deducted £1436 for residual products; thus making the net cost of coal £2119. Deducting the latter figure, wages (upon which he allowed an increase of 20 per cent.), rates and taxes, &c., he brought the total working expenses to £4836. This deducted from the £7872 gave £3036 as the net receipts. He estimated that a hypothetical tenant would require £7500; and he put down the statutory deductions at £912. He estimated the rateable value of the mains in the Friern Barnet district at £55; and he considered that the 20 per cent. he had put down to cover the increased cost of labour was a very moderate amount, as some of the London Gas Companies were paying 50 per cent.

Mr. *H. E. Jones*, the Engineer of the Commercial Gas Company, said that, having examined the works and accounts, he had come to the conclusion that the appellant Company had been grievously over-assessed. The rates worked out to 4¼d. per 1000 cubic feet—the largest rate with which he was acquainted except one, which was reduced six months ago. He was connected more or less directly with 28 companies, and the rates per 1000 cubic feet for these averaged less than 1½d. He considered the net rateable value of the mains in Friern Barnet as £75, which gave an average rate of 2d. per 1000 cubic feet.

Mr. PAGE, for the respondents, contended that 20 per cent. was too much to allow for the increased cost of wages, but that, having regard to the short period for which the rate was fixed, the percentage ought to be that which had actually taken place—viz., 7½ per cent. His witnesses would show that the rateable value of the mains in Friern Barnet was £482, as against the £339 which they claimed, and which had been paid for years. In deducting the rates, they differed from the appellants' witnesses, who took the average over the four parishes in which the works were situated. The respondents contended that only the actual rates of the parish for which the particular assessment was made should be deducted. In the present case, this would make a difference of between 5s. 4d. (the rate in Friern Barnet) and 5s. 10d. (the average rate of the four parishes).

Mr. *W. Eve*, in reply to Mr. BALFOUR BROWNE, said he inspected the works in February last, and again for the purposes of the appeal about three weeks ago. He estimated that £610 was the gross rental of the mains in the parish of Friern Barnet. From this would have to be deducted the rates. He took the rates at the actual figure in the parish—5s. 4d. in the pound; but as the Colney Hatch Asylum had recently been brought in at a rateable value of £12,000, which added about 40 per cent. to the rateable value of the parish, the rates must come down. However, deducting the rates at 5s. 4d., he estimated the net rateable value of the Company's works at £482.

Mr. *C. Jones* said it was on the basis of his valuation of 1882, founded on the Company's accounts for 1881, that the rateable value of £339 was fixed. This was an agreed figure; and that amount had been paid ever since.

Mr. *A. Silverthorne* said he considered £4354 was an ample amount

to provide for tenant's working capital. He put down £2270 as the net rateable value of the entire concern; the net rateable value of the hereditament in the parish being £403. He put down £18,254 as the structural value of the undertaking.

After deliberating in private for a short time,

The DEPUTY-CHAIRMAN said the Court thought the appellants had proved their case, and that the net rateable value should be £117. The costs would follow the event.

Mr. BALFOUR BROWNE asked their Worships to fix the gross rateable value.

The DEPUTY-CHAIRMAN said this would follow the net.

Mr. Richard W. Allen, eldest son of the senior partner of Messrs. W. H. Allen and Co., of the York Street Works, Lambeth, has just been taken into the firm.

Retford Corporation Gas Supply.—The report of the Retford Corporation Gas Department for the year ending June 30 last shows that, after meeting the interest on loans (£1423) and the payment to the sinking fund of £323, with a transfer of £500 to the borough fund, there remains to be carried to the profit and loss account £625, as against £638 in the year ending June, 1889.

The Water Supply of Malvern.—Last Thursday a special meeting of the Malvern Local Board was held, to consider the expediency of promoting a Bill in Parliament to authorize the Board to spend about £40,000 in improving the water supply of the town. It was decided to proceed with the scheme for acquiring what is known as the Rabbit Warren estate; and to lay the matter at an early date before a town's meeting.

Australasian Gas Association, Limited.—The second annual meeting of this Association will be held next Thursday, at which the accounts for the year ending June 30 last will be presented. The revenue account shows that the receipts amounted to £6725, deducting the expenditure from which there remains a balance of £2665. From this an interim dividend at the rate of 7 per cent. per annum was paid in March last, leaving a balance of £1473; and it is now proposed to declare a further dividend at the same rate for the second half of the year. Since their last report the Directors have added to the former stations—viz., Benalla, Maldon, Seymour, Shepparton, Wangaratta and Warragul—the works at Box Hill and Surrey Hills, Melbourne, which are rapidly-growing suburbs. The Sandgate works, near Brisbane, Queensland, which were under construction last year, have been completed, and are in operation with every prospect of the Directors' anticipations being fully borne out.

Lighting of Courts and Alleys in Manchester.—This matter was before the members of the Manchester City Council at their meeting last Wednesday. At the request of Alderman Lamb, the Town Clerk read a resolution passed at a meeting on Sept. 26, to the effect that, as recommended by the Street Mains and Lighting Sub-Committee, and inasmuch as 26 courts and alleys referred to in a report of the Committee were private property, the Committee recommended the Council to authorize that the cost of the maintenance, lighting, &c., of the lamps required, together with the cost of the gas supplied, be defrayed out of the gas profits, as was the case with the public street lighting, provided the owners of the property in the courts in question would agree to pay the net cost of laying service-pipes and providing and fixing the lamps. The Committee resolved at the last meeting that the resolution be rescinded; and that, in the interest of public health and morality, an experiment be made as to lighting courts, and that the Council be recommended to empower the Committee to place a lamp in the most favourable position in each of the 26 courts named, at an estimated cost of £91, and an annual cost of lighting and maintenance of £79. Alderman Lamb having formally moved the adoption of the report, a discussion ensued, in the course of which several members urged that light should be carried into all the dark courts and alleys, no matter who bore the cost; while others argued that powers should be obtained with a view to compelling owners to bear at least a portion of the burden. An amendment was moved by Mr. M'Dougall, and seconded by Mr. Boddington, approving of the Committee's proposals, and requesting them to prepare a more comprehensive scheme. Alderman Lamb accepted the amendment on behalf of the Gas Committee; and it was adopted.

The Public Lighting Question at Lewes.—In the course of some remarks made at the last meeting of the Lewes Town Council by Alderman Farncombe on the proceedings of the Highways and Works Committee, he referred to the recent agitation in regard to the lighting of the borough. He said he had good reason to believe that the Gas Company were willing to make a contract at the price he offered—viz., 3s. 6d. per 1000 cubic feet, and to abandon the proposed charge for lamps altogether. He thought these terms were satisfactory. The town had recently been very much disturbed on the lighting question; and they appeared to be rushing headlong from gas to electricity. But even if they finally decided to do this, they could not fit up the electric light so as to be ready for use by the end of the year, when the contract for lighting by gas expired. He therefore felt it to be his duty to endeavour to make arrangements to at least get over the present difficulty. If his suggestion was carried out, they would only have to pay for the gas actually consumed. The Company proposed to put meters in about twenty lamps, situated at various parts of the town; and from these an average would be taken of the whole. If this did not prove satisfactory, a meter could be put in every lamp-post. It was only a question of rental. The Company were willing to erect larger lamps at various points, having four or five burners in each. Each of these would have a meter; and the exact cost could be readily ascertained. The proposal to have electric light for Lewes need not be impeded by the new arrangement with the Gas Company; and the latter need not fear its introduction. He was greatly astonished that the people of Lewes had gone as far as they had with regard to electricity. The more he studied the question, the more convinced he became that electric lighting was not an enterprise which came within the proper range of the functions of a Town Council—at any rate in its present state. No further allusion was made to the matter.

MISCELLANEOUS NEWS.

LABOUR TROUBLES AND THE SUPPLY OF GAS COAL IN NEW ZEALAND.

In the JOURNAL for the 14th ult., we noticed two reports lately received by the Secretary of the Dunedin (N.Z.) Surburban Gas Company, Limited, from Mr. W. Daley, the Engineer, in which he dealt with the labour difficulties agitating the colony, and their attendant troubles as far as the conduct of the undertaking entrusted to his care was concerned. At the date of his report, the whole question of the coal supply was, and had for some time been most unsatisfactory; practically all the gas coal mines in New Zealand being stopped. At Greymouth—the principal mines—the men had been on strike for more than a month; and there was not a pound's worth of gas coal in the market. Attention was being turned to distant sources, in New South Wales; and further supplies were expected from Nightcaps and Kaitangata. The possible stoppage of the gas was seriously considered by the City Council; and they determined to exercise every care to prevent the streets being left in darkness. At the end of August, Mr. Daley had sufficient coal in stock at the Caversham works to last till the 1st of November; and if by that date the strike was not at an end, he intended to fall back upon wood for producing gas, having had many years' experience in Russia in the use of this material for gas-making purposes, with very good results. Owing, however, to the prevailing strike and the early-closing movement, his consumption had fallen off very considerably, especially in the borough, which is largely inhabited by an industrial population. On Sept. 17 the City Council had before them a report by the Gas Committee, in which the question of keeping up the supply of coal at the Corporation gas-works was alluded to. The Gas Engineer had, it was stated, visited the Nightcaps mine, and tested some of the coal with reference to its value as a gas-producing material; and the result had been that they had ordered 100 tons, which was being used with the West Coast coal in stock on the works. Coal from this mine was tested at the Caversham Gas-Works, and was found to yield 8000 cubic feet of 13-candle gas, but not any coke. Its price was 27*s.* per ton delivered in Dunedin. At Wellington, the Grey Valley Company were under contract to supply the Gas Company, but experienced great difficulty in doing so in consequence of the position of affairs at the West Coast mines.

It may be of interest to add here the views of the Hon. G. M'Lean on the subject of the labour movement, as expressed to a representative of the Christchurch press. He said: "I have nothing to say against the men at the head of affairs who have been creating all this commotion. They are respectable and honest, I have no doubt, in their desire; but the art of government is not learned in a year, nor perhaps in a lifetime. Is it to be supposed that these men are able to handle the whole of the industries of the colony, to gather the Unions together, and to hand over to them—all men who have no experience in government or in combining—all the trades for good? They have lost their heads, have called this and the other out, and they will have the country in a pretty state presently. But the people will begin to settle down again; and although it may put New Zealand back a few years, out of all this good will come. I am not a prophet, but I venture to say that it will not be long before we shall see every industry going on as hitherto. But what will be the difference? That these men in the Unions and corporations, through having to pay £3 for an entrance fee, will be short of employment. All these will vanish, and then the other people who have been left out in the cold will have their innings. I do hope that these men will earnestly think of the position they have placed themselves in, and will take an opportunity of retiring from the position they have taken up. I am sure that there are symptoms now observable which lead one to think that the end is not far off. Men have been led to think that their employers have all been making money; that they have a mint behind them with which they coin sovereigns to hand out. But it will be brought home to them that every industry will stand so much according to its value in the world; and if they keep raising the wages till they eat everything up, there will be nothing left to pay them with. What, then, is the good of wages being raised to ruin the employer? They have got to understand this; and they are beginning to understand it now."

Since the foregoing was in type, a telegram received from Wellington, through Reuter's agency, states that the strike in the colony has ended, and that the unconditional resumption of work has been ordered.

BUENOS AYRES GAS SUPPLY.

The New Works of the Co-operative Gas Company.

Our readers may remember that some time ago a Company was started in Buenos Ayres, under the title of the Co-operative Gas Company, to compete with the existing undertakings for the supply of gas in the city. It was thought that the rapid increase in population, and the consequent springing up of fresh districts which were not served by the old Companies, gave the new venture a *raison d'être*; although there were many who held the opinion that it was not wanted. However, the scheme was started, and the services of Mr. G. E. Stevenson, M. Inst. C.E., were secured as Engineer; and from his designs and under his supervision works of considerable magnitude were constructed. Unfortunately, owing to internal troubles in the country, they have not yet been put in operation; and, after a careful review of the situation, the Directors of the Company have decided to amalgamate their undertaking with the Argentine Gas Company. This was originally a small undertaking started by a Frenchman something like 20 years ago, for furnishing a supply of gas from oil; but the works have been greatly enlarged under the direction of the Company's Engineer (Mr. W. B. Whitaker, Assoc. M. Inst. C.E.), and are now supplying a large area of the city. The early history of this Company shows that it was surrounded with difficulties. Not only

were the shares practically worthless, but the Company had a heavy debt hanging over it. The shareholders had to go on for years without a dividend, in order that this debt might be cleared off; and with a very small capital, the concern had to compete with, and hold its own against, its rivals. By perseverance and steady work, however, the Directors and their Manager (Mr. W. Woodgate) have brought it through all its troubles; and it now seems destined to become the most important gas undertaking in the city. For the past few years the shareholders have received 22 per cent. dividend, in addition to which there have been surplus profits which have been spent in the erection of new premises and the provision of improved plant. So stable has the concern become, that it has not only stood firm in the midst of the financial crisis which has overtaken the country, but has maintained its shares at something like 80 per cent. premium. Finding the business increasing, and seeing that in a few years they would require very much larger works than those they possessed, the Directors entered into negotiations with the Co-operative Gas Company for the purchase of their new ones; and eventually these were acquired. A few weeks ago both works were visited by a number of gentlemen interested in the amalgamated undertaking; the older establishment being inspected first. Mr. Woodgate having conducted the party round, and indicated the improvements he had carried out in the various appliances, their attention was directed to the telescopic gasholder now in course of erection by Messrs. R. and J. Dempster, of Newton Heath, Manchester. It is 90 feet in diameter and 60 feet high, in three lifts; and is capable of containing 350,000 cubic feet of gas. The tank has been constructed from the plans and under the supervision of Mr. Whitaker. From the old works the party proceeded to those which Mr. Stevenson has lately completed. The area occupied by these works is about 43,000 square yards; and they have been designed to produce about 1¾ million cubic feet of gas per diem. The retort-house is 215 feet in length by 70 feet in width (internal measurement). The walls are 31 ft. 6 in. in height; and they are surmounted by an iron roof composed of elliptical lattice girders and T-iron rafters, covered by pitch-pine boards and French tiles. The coal-store is behind the retort-house, and communicates with it by arched openings. It is capable of stacking 7000 tons of coal. There are 256 retorts, which are equal to carbonizing 150 tons of coal in 24 hours. There are an engine and exhauster house, boiler-house, and pump-room. In the engine-house there are four sets of engines and exhausters, each capable of drawing about 900,000 cubic feet of gas per diem; so that when the works are fully in operation, two exhausters will be used and two held in reserve. There are three boilers, each 6 feet diameter; and in another apartment six pumps are worked by a separate engine—two for water, two for tar, and two for ammoniacal liquor. There are also two donkey pumps—one for feeding the boilers, and one for pumping water to the scrubbers. Above the pump-room is a water reservoir for supplying the works. There are large annular condensers and two tower scrubbers. The latter are 80 feet high and 12 feet diameter. The purifying-house is 147 feet long by 90 feet in width. It contains four purifiers, each 24 feet square; and there is space for four more of equal dimensions. Next comes the building in which the station meter and governors are fixed. The latter are all for pipes 2 feet in diameter. Lastly come the gasholders. Of these there are two, each capable of storing about 900,000 cubic feet of gas. They are 120 feet in diameter, and rise 60 feet high when full. The works comprise plant for the manufacture of sulphate of ammonia; its capacity being 2 tons of salt per diem. There is also a tar-distilling plant capable of dealing with 2000 gallons of tar daily. There is a handsome residential building for the Manager and clerks; and ample accommodation has been afforded for storing materials, for workshops, and for offices. A laboratory and testing-room, fitted with all the necessary apparatus for testing the gas, coal, and products, has also been provided. The system of piping embraces the whole of the west and southern portions of the city. The principal mains are 2 feet and 18 inches in diameter. There is a railway siding into the works from the Provincial Railway, and a branch of the Anglo-Argentine Tramway circulates all round them; so that coal can be received and coke and other materials despatched either by rail or tramway. There are four principal chimneys in the establishment—two 80 feet, and two 60 feet high; besides a smaller one for the tar-distilling plant.

New Joint-Stock Companies.—The following new joint-stock undertakings have been registered: Hallas Gas Company, Limited, with a capital of £5000, in £5 shares; Illuminating, Heating, and Power Gas Company, Limited, with a capital of £15,000, in £10 shares.

Quality of the Middlesbrough Water Supply.—The prevalence of typhoid fever in the Middlesbrough district having been attributed to a certain extent to the water supplied by the Stockton and Middlesbrough Water Board, Professor Frankland has analyzed and examined samples of the water, and reports that they were very slightly turbid, and stained with peaty matter in solution; but the organic matter is entirely of vegetable origin. The water is free from every trace of contamination; it is wholesome; and, with the expection of a peaty taste, is in all respects excellent for domestic use.

Appointment of Mr. G. Cockburn as Borough Accountant of Ramsgate.—At a meeting of the Ramsgate Town Council on Thursday last, Mr. George Cockburn was appointed Borough Accountant in the place of Mr. James Mongor, deceased. Mr. Cockburn has been Accountant to the Gas and Water Departments of the Borough for the last twelve years; and his services in this capacity have been justly recognized by the Council in his advancement to the post of Borough Accountant, which is now amalgamated with the Gas and Water Departments. His conspicuous abilities as an accountant have been from time to time the subject of remark by the various Committees, as well as by the general Council, when financial reports have had to be prepared and presented, either as annual statements of the Departments, or for the information of Local Government Board officers at public inquiries; and although the Council could not well have arrived at any other decision than the one to which they have come, Mr. Cockburn is to be congratulated on having, by his knowledge and industry, succeeded in securing the honourable position.

CEARA GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Friday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. HORATIO BROTHERS in the chair.

The SECRETARY (Mr. T. Guyatt) read the notice convening the meeting; and it was agreed to take as read the report and accounts for the year ending June 30 last, some particulars from which were given in the JOURNAL for the 21st ult. (p. 861).

The CHAIRMAN said it became his duty, before moving the adoption of the report and accounts, to make a few remarks upon the working of the year. There was an increase in the gas-rental of £396; being all derived from private lighting. The revenue from residual products was less by about £171, and the amount produced by the sale of fittings was also smaller; but this was occasioned not so much by less work having been done, as by a lower profit having been charged on the fittings, in order to encourage the use of gas. The total receipts were £65 more; but, on the other hand, the expenditure had increased by £729—principally due to an increase in the general charges of £579, and in exchange of £750. The general charges included the expenses incurred by the triennial visits to England of the officials at Ceará; and the expenditure caused by deaths, and in filling vacant positions. Charges of this kind were heavier in the past year than usual. Exchange was also against the Company to a considerable extent. Under this head in the previous year nothing was charged; while in the past year they lost £750. Maintenance exhibited a decrease of £323. The quantity of coal carbonized was less by 24 tons; and the outlay for coal was smaller by £40. During the year the cost per ton was £2 1s. 4d., as against £1 19s. 8d. in the preceding twelve months. The production of gas per ton was about 350 cubic feet more; and the unaccounted for gas was 7 per cent., as compared with 7½ per cent. The remaining items were nearly the same, and called for no special observations. The net profit was £653 less. Deducting the increase in receipts (£65) from the additional expenditure (£729), there was left £664, which showed that the working was about the same as in the previous year, which was a very good one—if not the best year the Company had had. As would have been seen by the report, the Directors proposed to add a further £1000 to the reserve fund. Generally speaking, he thought the working of the year had been highly satisfactory. The fact that they had not realized quite so much profit was entirely due to causes over which the management at Ceara and the Board had no control whatever; but he had no doubt that the continuance of the present good management would result in returns equal to those of the past. The Directors had found it necessary to make a call on the unpaid shares. All the capital had been invested; and they had nothing to depend upon except the reserve fund and their own credit. It was therefore essential that they should make an issue of the unallotted 10 per cent. preference shares. There had been a general response to the Directors' invitation to the shareholders to take a portion of these shares; and he would have been very surprised if there had not been, as 10 per cent. in these days was not easily procurable. In conclusion, he moved that the report and accounts be received and adopted.

Mr. J. DARELL BLOUNT seconded the motion, which was unanimously carried.

On the motion of the CHAIRMAN, seconded by Mr. BLOUNT, it was agreed to add £1000 to the reserve fund (making it £4000), and to pay a dividend for the six months ending June 30 of 5 per cent. on both preference and ordinary shares, making, with the interim dividends, 10 and 9 per cent. respectively.

The retiring Director (Mr. A. J. King) was unanimously re-elected, on the proposition of the CHAIRMAN, seconded by Mr. F. A. WALLROTH; and the Auditor (Mr. Robert King) was likewise reappointed, on the motion of Mr. ANDREWS, seconded by Mr. HART.

The CHAIRMAN, in moving a vote of thanks to the Engineer (Mr. T. M'Making, Assoc. M. Inst. C.E.), the Secretary, and the staff generally, mentioned that the Engineer had lately been in England; and the statement he made to the Board concerning the Company's affairs was highly satisfactory.

The motion having been seconded by Mr. KING, and carried, the SECRETARY suitably acknowledged the vote.

On the proposition of Mr. W. C. PARKINSON, seconded by Mr. G. DANNATT, a vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, in returning thanks, observed that the dividend warrants would be issued in about a week. The Directors had experienced some difficulty in getting their money from the authorities at Ceara; but he believed matters were now mending.

The proceedings then terminated.

ODESSA WATER-WORKS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held last Wednesday, at the Cannon Street Hotel, E.C.—Sir PETER SPOKES in the chair—"for the purpose of conferring with the Board, and determining the future policy of the Company."

The SECRETARY (Mr. W. D. M. Forrest) having read the notice convening the meeting,

The CHAIRMAN at once proceeded to address the shareholders. In the first place, he referred to the loss which the Board and shareholders had sustained in the death of one of the Directors, Mr. John Corner, who had held office since July, 1884; and stated that, his death having occurred almost on the eve of the meeting, the Board had not thought fit to fill the vacancy, but the shareholders would be invited to elect someone to the position. With regard to the business before the meeting, he said he entered upon it with considerable diffidence, lest anything he uttered should in any way widen the difference which existed between the Company and the Municipality of Odessa; but when he told the shareholders that the demands made upon them as a condition of the renewal of negotiations for putting an end to the state of affairs which had existed almost since the formation of the Company, were such that the Board did not consider it proper to concede, they would not be surprised that the Directors wished to take counsel with the

proprietors upon the policy of the future. Since the recons truction of the Board in 1884, notwithstanding the onerous character of the concession under which the Company were working, they had endeavoured to keep honourably to the spirit, as well as to the letter, of the contract; and in April, 1888, the Directors felt justified in stating that, at no former period of the Company's history, had there been so good a prospect of amicable and cordial arrangements with the Municipality. Meanwhile every precaution was taken to meet the demands of the rapidly increasing population by an outlay amounting in the aggregate to thousands of pounds. But in the autumn of last year, it became evident that the old spirit of exaction was again manifesting itself; and the Directors felt they had no alternative but to express to the shareholders their regret that the negotiations had again broken down. It was very clear that the local governing body of Odessa wanted not only their pound of flesh, but something besides; and this the Directors were not willing to yield. In addition, there was also the fact that it was impossible to collect from the Imperial Government of Russia, the sum due for water supplied to the garrison, now amounting, at the present rate of exchange, to from £12,000 to £13,000. Judgment had been given in this matter in the Courts of First and Second Instance, in favour of the Company; but an appeal to the Senate had been lodged. It appeared that the Minister of War and the Minister of the Interior could not agree as to who should pay this amount—whether the War Department or the town of Odessa. It had been suggested that the shareholders should delegate three or four of their number to confer with the Board, so that they could discuss the present position of affairs in a calm manner. Whether they would adopt this suggestion or proceed to discuss the matter at once, was a matter for the shareholders to settle; but personally he thought the former would be the wiser course.

Dr. GOODSALL proposed that three gentlemen be appointed to confer with the Directors, and present a report at an adjourned meeting.

Sir JAMES C. LAWRENCE, Bart., seconded the proposition; but intimated that he should prefer five delegates to three.

After some discussion, in which Messrs. Thomas and Francis took a prominent part, it was agreed to amend the resolution in accordance with Sir James's suggestion; and it was then adopted.

The following gentlemen were selected as delegates: Sir J. Lawrence, Rev. J. Daws, and Messrs. Goodsall, Francis, and Thomas.

It was also decided to adjourn the meeting to a day within the ensuing three months, to be fixed by the Committee when their report is ready. At the adjourned meeting, a Director will be elected.

THE NEW GAS-WORKS FOR RAWMARSH.

The new gas-works at Rawmarsh were formally "opened" last Thursday afternoon; and the event was taken advantage of for much local public rejoicing. The works have cost about £12,000, and have been erected (from the plans of Mr. T. Newbigging, C.E., of Manchester) by the Local Board. By a Special Act of Parliament, the Board obtained in 1879 the power to purchase from the Rotherham Corporation the gas pipes within their district, and were also authorized, after the expiration of nine years, to construct works of their own for the manufacture of gas. Since 1879 the Rotherham Corporation have supplied the Board with gas in bulk, which has been measured through a station meter fixed at the boundaries of the two authorities. In pursuance of the provisions of the Act, the Local Board have now erected new works, which are compact and economical in their arrangement, and capable of producing from 25 to 30 million cubic feet of gas per annum. The present consumption of the district is from 18 to 20 million feet. The works include a retort-house, 77 ft. by 28 ft., containing 30 retorts supplied by the Farnley Iron Company, of Leeds, and set by Messrs. J. Drake and Son, of Halifax. There is also an ample coal-store, so placed that a siding from the adjacent railway can run through it. The purifying-house is 46 feet square inside; and it is arranged to contain four purifiers, 10 feet square, and 4½ feet deep, with a 10-inch centre valve. An engine, exhauster, and boiler house is built abutting on the retort-house. This building is covered by a cast-iron cistern, divided into three compartments for clean water, ammoniacal liquor, and tar. On the left of the entrance to the works is the weigh office, with waggon weighbridge in front; and to the right is the station meter and governor house, 22 feet long by 14 feet inside, the apparatus for which was supplied by Messrs. Guest and Chrimes, of Rotherham. A boundary wall of brick encloses the site; and there is a neat entrance with stone posts, folding gate, and side door. The machinery is of the most modern type. The contractor for the buildings and gas tank was Mr. W. H. Trehern; and for the gasholder and ironwork generally, Messrs. R. and J. Dempster, of Manchester.

In order that the opening of the works might be fittingly commemorated, a Committee was formed consisting mainly of members of the Board and other local gentlemen who opened a subscription list. They succeeded in raising about £80; and this was spent in the preparations. Gas devices of various kinds were placed in the main thoroughfare; and there were triumphal arches, festoons, Venetian masts, shields, and trophies of flags on the lamp-posts, streamers across the highway, and every sign of festivity. The members of the Local Board and their friends met on Thursday at the Board's offices, at two o'clock, and a procession was formed in which, among numerous others, the following gentlemen took part: The Mayor of Rotherham (Mr. R. Jen kins), Mr. T. Newbould (Chairman of the Local Board), Mr. J. Smith (Chairman of the Gas Committee), and Mr. C. Booth (Gas Manager). The procession was accompanied by a brass band. On arriving at the works the Chairman of the Gas Committee presented Mr. Newbould with a gold key; and on behalf of the members of the Local Board and the ratepayers, asked him to open the entrance to the gas-works to the public. Mr. Newbould said he had much pleasure in accepting the key, and was extremely obliged to the Local Board, who had done him the honour to ask him to open so important an undertaking. He then opened the side gate leading to the works, and the people were freely admitted.

An open-air meeting was afterwards held, at which the Chairman of the Gas Committee presided. In the course of an interesting speech, Mr. Newbould said he looked upon it as a red letter day in the history of Rawmarsh. He believed it was ten years ago—on Oct. 26, 1880—when the Local Board entered into the agreement with the Rotherham Corporation for the purchase of the mains, &c., in the parish, and took the supply of gas in bulk. A valuation was made; and the Local Board paid to the Rotherham Corporation the sum of £3236 for the mains, &c. A station meter was placed at Little Bridge, which still remained the joint property of the two authorities. The consumption of gas by Rawmarsh during the ten years had been 171 million cubic feet; and during the whole of the time, the same price had been paid to the Rotherham Corporation as the latter charged to private consumers. The Board had had to distribute the gas and bear the expense of collecting the rents, and the losses through leakage. Eighteen months ago the Board thought the time had arrived when the Rotherham Corporation should be approached respecting some abatement in the price of gas, if the contract with them had to be renewed. Communications were made; but the Board were not treated in a business-like manner. Ultimately they were offered a reduction in the price of 3d. per 1000 cubic feet of gas, which "generous" offer they declined. They considered at the time they had not been regarded in a very neighbourly spirit. He then explained the steps taken by the Local Board for the erection of the new gas-works; remarking that if the Rotherham Corporation could afford to throw over a customer like the Local Board, which consumed 18 million cubic feet of gas per annum, they must be in a very good position financially. He gave particulars of the works, as to the cost, and the quantity of gas that could be produced; and said the Local Board had borrowed £13,000, the repayment of which extended over periods of 20 and 30 years. Other gentlemen also addressed the meeting. Subsequently tea was provided in the Free Methodist School-Room, at which the Chairman of the Board entertained about 100 guests. This was followed by a general illumination and fireworks.

BRADFORD CORPORATION GAS AND WATER SUPPLY.

Annual Reports of the Committees.

The Gas and Electricity Supply Committee, and the Water Committee of the Bradford Corporation have issued their annual reports upon the working of the departments under their direction.

The first-named Committee state that the whole of the gas plant and other property is in a good state of repair. During the past year 16,684 yards of mains and 991 new service-pipes have been laid down. At the Mill Street works 120 old retorts have been taken out and replaced with new ones, and the rest have been repaired; at the Thornton Road works 160 retorts have been erected in place of old ones, and the remainder have been repaired; and at the Valley Road works 290 new retorts have been set, and the remainder have been repaired. With a view to the future extension of the last-mentioned works, the Committee have acquired land and buildings in Valley Road adjoining the works. The land comprises an area of 5262 square yards; and the price agreed upon is £7750. At the Birkshall works no new retorts have been required. The tender of the West's Gas Improvement Company, Limited, has been accepted for the supplying and fixing of new machinery required at these works for £6000. Contracts have been entered into for the supply of 68,000 tons of coal and 10,000 tons of cannel on satisfactory terms, having regard to the present high prices. The number of cooking-stoves sent out on hire during the year is 134; making a total of 669 since the opening of the gas-stove department in April, 1884. The number of cooking and heating stoves sold during the year is 747, or a total of 4990 since 1884. In the early part of the municipal year, an application was received from the gas-stokers and men employed at the various gas-works, asking for a revision of their rates of pay and conditions of service. A deputation from the stokers had several interviews with the Committee, and satisfactory terms were eventually arranged. The wages of the workmen engaged in laying mains and service-pipes have also been adjusted. A memorial having been presented by the gas-meter inspectors as to their conditions of service, the matter was carefully considered, resulting in a list of their duties and regulations relating thereto being formulated to the satisfaction of the men. The Clayton, Allerton, and Thornton Gas Company have made an application to Parliament for power to extend their works; and the Committee deemed the occasion favourable to making an effort to get the gas consumers of Allerton placed on an equal footing with the gas consumers in other parts of the borough. An interview accordingly took place with the Directors of the Company, but no terms could be arranged, as the Directors absolutely refused to negotiate for the sale of a portion only of their undertaking, but were willing to dispose of the whole. The price asked, however, was excessive, and could not be entertained, so that the matter has been dropped. It was then proposed to the Company that the Corporation should take gas in bulk for the places within the borough supplied by the Company, and pay the ordinary price for the same, so as to enable the Committee to supply the ratepayers at the same price as is charged for Corporation gas. But this arrangement the Company absolutely refused to enter into. In consequence of Mr. Swallow's resignation of the gas-works engineership, after nearly 67 years' faithful service under the old Company and the Corporation, it became necessary to rearrange the management of the department. Mr. Swallow's services have been retained as Consulting Engineer; and Mr. W. Wood, formerly assistant to Mr. Swallow, has been appointed Engineer, at a salary of £450 per annum. Mr. C. Wood, formerly Superintendent at the Thornton Road gas-works, has been appointed Deputy-Gas Engineer, and Mr. H. Akam has been selected to take charge of the works at Thornton Road. Mr. C. B. Holdsworth has been appointed to the post of Sub-Manager of the gas-works, to carry out a large part of the clerical work which was formerly done by Mr. Swallow. During the year 2057 tons of sulphate of ammonia have been manufactured at the chemical works at Frizinghall, against 2030 tons produced last year; the average price being £11 17s. 3d., against £12 3s. 7d., or a decrease

of 6s. 4d. per ton. There have been produced from the spent oxide of iron 1773 tons of sulphuric acid, of which 4191 tons have been used in the manufacture of sulphate of ammonia. The quantity of sulphuric acid manufactured last year was 1715 tons. With regard to public lighting, the Committee report that there are 754 2-light lamps in the borough; being an increase of 29. The total number of lamps in the borough is 6932, against 6716 last year. Since the formal opening of the electricity works on Sept. 20, 1889, the supply of electricity has been continued regularly on all week-days. To meet the convenience of many of the consumers, the supply, since May 13, has been commenced at 10 a.m. and continued to 11 p.m. on the first five days of the week, and to 11.30 p.m. on Saturdays. Owing to the rapid increase in the demand for a supply of electricity, the whole of the plant, including the spare machinery, was in use by the end of December last. To meet the increasing demand, the Committee ordered from Messrs. Siemens Bros. and Co., Limited, an additional Willans engine of 300 indicated horse power coupled direct to a Siemens dynamo, capable of developing 240 electrical horse power, together with the necessary feeding mains and instruments, which will greatly increase the output without materially adding to the cost of the works. A set of storeage cells which has been ordered from Messrs. Crompton, Howell, and Co., is now being fixed at the works for the purpose of supplying current at any time when the demand is not sufficient to keep the engines fully employed. These cells will have a capacity of 1000 ampère-hours. Between two and three miles of distributing mains have been laid during the year. The plant, which will be available for the ensuing winter, will consist of three mild-steel Lancashire boilers 28 ft. by 7 ft., and of 180 indicated horse power each, and four steam-engines of the inverted vertical type, three of 150 and one of 300 indicated horse power, working at 120 lbs. steam pressure. Each engine is coupled to and drives direct a Siemens dynamo; three being capable of developing 120 electrical horse power, and the fourth 240. The current from each dynamo is delivered to a conductor common to all, whence it is supplied to the various feeding mains. Six of the latter will conduct the current to their respective feeding centres, situated at different points in the town, and suitable controlling apparatus at the central station will ensure a uniform electrical pressure of delivery at the feeding centres. Mr. Shoolbred has been retained as Consulting Engineer; and Mr. Sidney W. Baynes has been appointed Managing Engineer of the works at the salary of £250 per annum.

The Water Committee report that a constant supply of water has been maintained at all the levels during the past municipal year. The water in store at the present time is more in quantity than has been the case for a number of years past, owing to the copious rainfall of the past four months. The filtration works at Thornton Moor, reported last year as being then in progress, are being vigorously pushed on; and nearly 75 per cent. of the work has been completed. It is hoped that the filters will be in operation in the early part of next year. The low-level reservoirs have continued in good working order. The income from the sale of water during 1889 and the three months ended March 31 last was £144,283, as against £108,896 in 1888.

LINCOLN CORPORATION GAS AND WATER SUPPLY.

The Annual Accounts.

The accounts of the Lincoln Corporation and Urban Sanitary Authority for the year ending March 25 last have recently been published by the City Treasurer (Mr. J. S. Battle). The statement dealing with the Gas Department shows, under the head of capital, a total indebtedness of £191,330—viz., capital value of gas annuities, £171,450; loans on mortgage, £8000; and loans paid off by the Corporation, £11,880, including balance advanced by bankers. On the credit side, the cost of the undertaking is put down at £192,196. The revenue account for the year gives a total of £41,828. The cost of manufacture of gas was £14,275—viz., coal, £8702; purifying, £688; salaries of officers at the works, £461; wages (for carbonizing), £2260; and repairs and maintenance of works and plant (including renewal of retorts), &c., £2163. A sum of £802 was paid for the distribution of gas; and rents, rates, and taxes absorbed £1061. A sum of £788 was expended in the purchase of cooking-stoves. For law costs £126 was paid; and £98 was charged for expenses of the Corporation stock. The cost of management was £825. The annuities paid amounted to £3249; and £1333 was required to meet current liabilities—viz., for proportion of interest on loans and annuities. The interest on Corporation stock amounted to £5590. There had been transferred to the sinking fund a sum of £2045, and £10,000 had been placed to the reserve fund. The balance amounted to £2213. On the credit side of the account, a balance was shown from last year's account of £13,387. The sale of gas brought in £20,924. The rental of meters yielded £530; and gas-cookers, £173. For residual products £6129 was obtained. There were 16,543 tons of common coal and 327 tons of cannel carbonized during the year. Regarding the Water Department, the total receipts were £8733. The maintenance and working expenses amounted to £2767; the rents of reservoir, ballast pits, &c., were £157; rates and taxes absorbed £513; and £500 was transferred to the general district rate fund. Interest on loans required a sum of £3261; and £1118 represented the amount repaid on account of loans. A balance of £1623 remained in the hands of the Treasurer. The capital account showed that the purchase of the water-works originally cost £63,827, and that £42,608 had since been expended in the purchase of land, the erection of new buildings, additions, and extensions. The gross amount of loans obtained on the undertaking was £105,000, of which £12,566 had been repaid by instalments.

The Edinburgh Exhibition Awards.—In an additional list of awards which have been published by the Executive of the Edinburgh Exhibition, Messrs. Dick, Kerr, & Co., Limited, of Kilmarnock, are announced as having obtained a gold medal for their "Griffin" gas-engine; and the United Electrical Engineering Company, Limited, of London, a silver medal for a gas engine.

THE NEW WATER SUPPLY SCHEME FOR DARWEN.

The Sub-Committee appointed to draw up a report dealing with the question of augmenting the water supply of Darwen, have issued their statement to the members of the Town Council. The report, which is a voluminous one, commences by detailing the preliminary steps which were taken when the question was first mooted. A statement follows as to the right to work the minerals under the Pickup Bank and Daisy Green reservoirs. Reports of the opinions of Dr. Percy Frankland and Professor Ivison Macadam, as to the fitness of the Pickup Bank water for domestic use, are added; also tables prepared by the Borough Treasurer, showing the comparative cost of the Blackburn and Thirlmere schemes over a period of 30 years, taking Thirlmere at 6d. to commence with, and 4⅜d. at the end of 15 years; and a similar table exemplifying a purchase of water in bulk from the Fishmoor reservoir of the Blackburn Corporation at 5d. to commence with, and 4¼d. at the end of 15 years. The Sub-Committee state that it is not certain these terms could be obtained from Blackburn, whose price is stated to them officially as 5d. for the whole term; but they hope that Blackburn might be willing to modify their price if Darwen made a firm offer to take the water at these prices, and in this way rather than by purchasing the Pickup Bank reservoir and works. The Sub-Committee assume that 100,000 gallons, in addition to the present supply of water, would be required in the year 1893, which estimate they consider to be a low one. With regard to filtration, they are of opinion that the water from Thirlmere will not require it, but that the water from Pickup Bank and Fishmoor will. The filtration of the water could be effected at the present hills reservoir conjointly with the Earnsdale water, which it is intended to filter there. The Sub-Committee make no suggestion as to the choice of the schemes, but lay them before the Council to decide which to adopt. Dr. Frankland, in his report, is of opinion that, if a few alterations were carried out, the Blackburn watershed would be capable of yielding a supply possessing the highest character for freedom from contamination with sewage and other refuse animal matters. Professor Macadam is clearly of opinion that, from a chemical point of view, the water in the Pickup Bank area is very suitable for introduction to Darwen. The Borough Engineer (Mr. Stubbs) estimates the cost of the Pickup Bank and Daisy Green scheme at £84,943; the Thirlmere scheme, at £16,531; and the Fishmoor scheme, at £8940.

Miss Kelman, who lectured on "Food and Dietetics" in the caterers' department at the recent Brewers' Exhibition, has been awarded a diploma for a gold medal. Miss Kelman is engaged to deliver the whole of the lectures at the forthcoming Food and Cookery Exhibition, to be held in the Agricultural Hall from the 5th to the 15th inst., at which a large number of gas-stove makers are to exhibit.

The Bolton Corporation Gas Committee and Gas-Stoves for the Working Classes.—The Gas Committee of the Bolton Corporation are anxious to extend the benefits of the gas-stove system to the working classes, and have with this view arranged for a supply of a special make which will be particularly adapted for the homes of artizans. The stoves will be smaller than those now in use, and will be fitted free. The charge for hire will be low; and the new arrangement will come as a boon to the working classes.

Winding Up of the Staffordshire Gas and Coke Company, Limited.—In the Chancery Division of the High Court of Justice, last Saturday, Mr. Justice Kay had before him a petition for the winding up of the above Company. The petitioners were solicitors, who were not connected with the formation of the undertaking, but had acted for them professionally subsequently to their formation. A bill of costs for £74 19s. had been delivered, but had not been paid. The Company were not represented; and his Lordship made the usual order.

Cutting Off Gas without Legal Notice.—At the Brentford County Court last Friday, Mr. Frank Arthur Ramsay, residing at Chiswick, sued the Brentford Gas Company for £25 damages for unlawfully entering his premises for the purpose of cutting off the gas supply. Plaintiff owed the Company 18s. 6d.; and the collector with another man called, and were shown by the servant into the pantry, where, in spite of plaintiff's protest, the meter was removed and the pipe closed with a cap. The plaintiff contended that, according to law, the gas ought to have been cut off without coming on the premises at all, and, moreover, that 24 hours' notice was required. The document said to have been served was not under the hand of the Secretary. The jury awarded £15 damages; adding to their verdict: "We consider the cutting off of the gas inside a building without the consent of the owner, improper." The Judge said, in his opinion, it was illegal; but, in any case, the action of the Company was illegal for want of notice under the Secretary's hand. It was stated that in one quarter 500 of such notices had been served, and that this was the Company's rule.

Damage to Water-Pipes by a Steam-Roller at Folkestone.—A long-standing dispute between the Folkestone Corporation and the Water Company now appears likely to terminate in litigation. The Company claim £13 as damages done to their mains by the Corporation's steam-roller; and the claim has been resisted on the ground of non-liability, and also on the contention that if liability of this sort be once recognized, the Corporation would lay themselves open to a number of similar claims. Why such a contention as the latter should be seriously entertained is not easily discernible to those who are constantly hearing of claims made by the corporations and local bodies of the country against gas and water companies for the "inefficient" reinstatement of roads which have been disturbed for the laying or repairing of service-pipes. There can be no doubt as to many of the complaints respecting the reinstatement of the roads being frivolous. But since notice is so frequently taken of these complaints, one cannot blame the companies for being equally firm when damage occurs to their property through the default of the governing bodies of the district. In the case of Folkestone, the Secretary of the Water Company (Mr. J. Minter) has informed the Town Council that if the claim is not forthwith liquidated, legal proceedings will ensue.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

There was little business before the Edinburgh and Leith Gas Commissioners last Monday; and there was consequently another of those particularly short sittings which give people the idea they do not bestow that care on their work which might be expected of them. As a matter of fact, a whole month's business was transacted in less than five minutes, which, I think, nearly everyone will agree with me in regarding as too short a period, even although the most painstaking preparation be taken into account. The reports by the Engineers from month to month show that the districting arrangements made last year have not been very carefully gone about. The area assigned to the Edinburgh works is larger than they previously served; and, as a consequence, the output from them has this year been going up each month, while on the other hand the area served by the Leith works has been reduced, and their output has been decreasing. The matter is of no importance so far as the revenue of the Commissioners is concerned, and is only of interest when viewed in the light of the opinion which it is perhaps an injustice to the Commissioners to suggest (for I believe they do not mean any such thing), that it gives the appearance of appreciating the Edinburgh works at the expense of the Leith works. Though I exonerate the Commissioners from any such intention, it is not out of place to point out that this may be the effect of their policy, and so give them the opportunity of guarding against such a result. When dealing with this question, it may be stated, as a counter to the above view, that in the event of the North British Railway Company acquiring the Edinburgh Gas-Works, it has been proposed to purchase land adjoining the Leith works, and to extend them so as to fit them for producing the whole of the gas supply. If this were done, the very reverse of what I have alluded to above would take place; and the Commissioners would probably have difficulty in re-arranging their engineering staff. At present they have two Engineers on the same level—Mr. R. Mitchell in Edinburgh, and Mr. F. T. C. Linton in Leith—and they have this week removed the only difference between them by levelling up Mr. Mitchell's salary to that which Mr. Linton received from the Leith Company, and has, of course, continued to have from the Commissioners since the transfer. They have each £700 a year now, which is probably more than the Commissioners would require to pay were they able to appoint one Engineer with subordinates under him. This they cannot, however, do until a vacancy arises in a natural way, which it is to be hoped will not be for a very long time; and so they must continue to carry out the present arrangement, which, apart from the cost, works extremely well. Among the other items of business were the granting of permission to the Town Council of Edinburgh to use the statutory testing-places in the Edinburgh and Leith works, and the reporting that instructions had been given by the Works Committee to the Clerk to obtain from Glasgow and other places information as to the price, &c., of gas, under the remit agreed to a month ago.

Regarding the quality of the gas in Edinburgh and Leith, I have one of the richest incidents to narrate which it has ever been my duty to pass through my hands. In the days of the Gas Companies, both had mains throughout almost the whole of Edinburgh. There was one street, however—Chambers Street—in which the Leith Company had no main, and in that street is situated the premises of Mr. J. Falconer King, the City Analyst, where fortnightly tests of the illuminating power of the gas issued by the two Companies were made. In order that he might have a supply of the Leith Company's gas, a small service-pipe—¾ inch, I think—was laid from their nearest main, several hundred yards away, into his office. Mr. King's analysis almost invariably showed the Leith gas to be inferior to the Edinburgh gas by two or three candles; and it was made matter of complaint by the Leith Company that the gas was unfairly tested, inasmuch as the gas which was tested was gas which had lain a fortnight in the small service-pipe. In the case of the Edinburgh gas, however, it was always fresh, because it was taken direct from the main; besides, this gas being used to light the office, there was no stagnation in the service-pipe. Mr. Falconer King has continued his practice of testing the gas fortnightly; and his reports to the Town Council almost without exception still show the "Leith" gas to be about 2 candles below the Edinburgh gas in quality. It turns out, however, that unknown to him, the town was districted, and that for more than a year, no gas from the Leith works has been sent into the district of the city where Chambers Street is situated. The mains which formerly belonged to the Leith Company have been coupled up with the Edinburgh mains, and, all unwittingly, Mr. Falconer King has been going on analyzing the Edinburgh gas twice, and issuing reports which showed one gas to be inferior to the other. The mistake has been discovered now; and, as stated above, the two gases are to be tested at the statutory testing-places of Waterloo Place for Edinburgh, and Canonmills for Leith. The question is being put, and some of the municipal candidates are endeavouring to make a point of it, how Mr. Falconer King could have gone on giving different results from the same gas. The answer is easily given; and it is that the affair shows how just was the complaint of the Leith Company when they said that their gas was not fairly tested. Nothing could more clearly demonstrate this than the fact that, when positively the same gas is tested by Mr. King, he obtains a very different result. Mr. Falconer King, it should be added, is not in the least degree to blame, because he ought to have been made aware of the change in the gas supply when the districting was effected.

The Aberdeen Town Council have reason to be highly pleased with the results they have derived from the Corporation gas undertaking during the past year. The output of gas was 10 million cubic feet more than in the previous twelve months, in which, again, it was 5 millions more than the preceding year. A very interesting discussion arose at the last meeting upon the proposal to raise the price of gas by 2d. per 1000 cubic feet—a step which was in the end resolved upon, but only by a narrow majority. There is, however, little room for complaint by the gas consumers, because two years ago the price of gas was reduced 4d. per 1000 cubic feet. If one were inclined to find fault with anything, it is that the amount of £742 for procuring the Electric Lighting Provisional Order should be charged against the Gas Department. Why cannot electric lighting, if it be such a grand affair as its advocate hold it out to be, stand upon its own ground? It is, at all events, almost a species of cruelty to make gas pay for its introduction. The charge is but another form of the proposal to divert the gas-works surplus to city improvements, which the Town Council so effectively snuffed out last week; and I am surprised to see it passed without challenge. If it was necessary to incur the charge, it should have been borne, not by the gas consumers, but by those who are to benefit by the electric light.

The Edinburgh Exhibition was set on fire last Saturday night, by an explosion of gas under a Griffin gas-engine, but the flames were soon extinguished. In such places as exhibitions, the pressure bags of gas-engines are usually kept out of sight; but in this instance, they were placed below the flooring. A leak in one of them saturated the air with gas; and the result was an explosion which ignited the woodwork, and might have proved serious.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

Mr. R. S. Simpson, one of the Commissioners of the Burgh of Gourock, has been giving his constituents some interesting information regarding the municipal gas supply undertaking. When he was elected three years ago, he was appointed, he says, a member of the Gas Committee, a position in which he has since continued. Last year he had the honour of being appointed Convener of that important Committee. He called it "important," because the Gas Trust, in regard to the amount of capital invested, the amount of income and expenditure, and the number of men employed, was the most important Trust under the control of the Commissioners. It gave him the greatest possible gratification to be able to report that this part of their work was in a highly prosperous condition. Each of the last three years they had managed to reduce the price of gas a little; and yet each year had found them with a larger surplus than before. It was surely very pleasing, he said, to be able to report that the net surplus this year was £294, and was £157 above the surplus at May, 1889. During the year 1889-90 the total quantity of gas sold showed an increase of nearly 2,000,000 cubic feet, or about 22½ per cent. over that of the previous year. The increase was largely owing to the supply required by the railway for the station, offices, &c., for the additional lamps in closes and stairs, and also for the great increase of gas required for cooking and heating purposes. They had now something like a hundred gas stoves and fires out on hire, besides about fifty that had been purchased from the Gas Commissioners or obtained otherwise. The number fitted up last year was forty. He was glad to say that there was every appearance of a still increasing consumption in the future. For the quarter ending Sept. 30 last, the amount of gas sold was 350,000 cubic feet more than the total sales in the corresponding period of last year; and the revenue from the sale of gas—though the price had again been reduced—showed an increase of fully £50. The coals would cost much more this year than they had for several years past; but generally the contracts had been made on very favourable terms. From all appearance, it might be expected that, when another year had run its course, the price of the gas would be still further reduced. Before leaving the subject of the gas supply, he desired to say that he attributed much of the success and general prosperity of the gas-works to the careful, painstaking, and skilful management of Mr. M'Ewan.

Last night week a meeting was held of the electors in the Third Ward, Greenock, which was addressed by Councillor Thorne, who briefly touched upon gas affairs. He said that during the past year there had been a radical change in the hours of labour of the stokers, and an increase in the expenditure for carrying on the gas-works. In March the stokers demanded a change from twelve to eight hours per day, and the same wages as had been agreed to lately in some of the principal gas-works in Scotland. The Gas Committee seriously considered the matter; and it was ultimately resolved to accede to the demands of the stokers. A small Committee of four members, of which he (Mr. Thorne) was one, recommended to the Police Board the payment of 4s. 6d. per day of eight hours, which was adopted. This entailed a considerable addition of expenditure, and would affect the present year more than the last, as the change to the eight-hour system only began on May 1, and the financial year ended on June 30.

At a meeting of the Fourth Ward electors of the same town, the representatives on the Police Board and Town Council were "heckled" on gas matters. A written question was handed to Bailie Shearer asking what steps their representatives would be prepared to take with the view of improving the quality of the gas. For his own part, he said he did not see that they required to improve the quality of the gas, as the average illuminating power had been 26½ candles for the year. He might state that all the towns round about—Glasgow, Paisley, &c.—were only giving gas of about 22 or 23 candles, perhaps less; and if Greenock was giving 26½ candles, he did not see that the ratepayers had much to complain of.

Ex-Provost Cochran, of Paisley, has been delivering himself of some notions that he strongly holds regarding the economics of the local gas supply. When the gas-works came into the hands of the Town Council, they were worth, he says, £40,000; and now they are valued at £104,000. He considers the Gas Trust a most successful one, all the more so that the undertaking has provided very large surpluses which have been spent in improving the town. At least £30,000 has been so spent, he said, and he defends that policy, notwithstanding the strong objections entertained against it by a number of his colleagues.

The past week has seen a marked recovery in the Glasgow pig iron market; Scotch warrants having advanced in price from 50s. 8d. per ton cash on Monday to 52s. 2½d. on Thursday, with the close yesterday a shade easier, buyers offering 51s. 10½d. cash per ton. The decline yesterday is said to have been due to the receipt of some unfavourable financial news from London. In hematite iron warrants, the fluctuations during the week have ranged between 57s. 7½d. per ton cash and 58s. 11d.; the closing price yesterday afternoon being 58s. 9d. cash buyers. The prices of Cleveland iron warants have fluctuated within more limited bounds—from 47s. 9½d. to 48s. 6d.; the closing price offered by buyers yesterday being 48s. per ton cash. There does

not seem to be any prospect of the strike and lock out of the blast furnacemen coming to an early termination; and as the stocks of pig iron in the makers' hands in Scotland are becoming rapidly exhausted, the imports from England are increasing.

As regards the coal trade, the position of affairs is practically unchanged. Despite the efforts of the miners to restrict the supplies, prices continue to decline in nearly every instance. The price of dross (which is a somewhat scarce commodity) is generally unchanged. Splint coal has been quoted in Glasgow during the week at 9s. 9d. to 10s. per ton f.o.b. at harbour shipping cranes; main coal, at 9s. 6d.; steam coal, at 11s. 4d. to 11s. 6d.; and ell coal, at 10s. 6d. The price of Ayrshire coal at the shipping ports has ranged at about 9s. 3d. to 9s. 6d. per ton. In most cases the ironmasters are sending large quantities of coal into the open market, as the demands for their blast furnaces are now *nil*. Some of the miners' agents are beginning to see in the near future a reduction of wages as a very probable thing.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 1.

Sulphate of Ammonia.—Great stagnation still prevails, for which, as previously explained, the state of the nitrate market is principally responsible. Continental orders are conspicuous by their absence; and buyers on this side can only be tempted by low prices. In fact, were it not for the firm attitude of makers, warranted by their small stocks, prices might ere this have reached a lower level. The quotations to-day are £11 10s. to £11 7s. 6d., Hull; £11 8s. 9d. to £11 6s. 3d., Leith and Liverpool—the lower quotations being accepted for second-hand parcels. As regards nitrate, the visible supply is about 40,000 tons in excess of last year; and shipments are likely to continue heavy. Cargoes at port of call are worth only about 7s. 10½d. to 8s. per cwt.; and November-December sailings, 8s. to 8s. 3d. Rumours of a combination (almost a necessity under existing circumstances) are again current.

LONDON, *Nov.* 1.

Tar Products.—This market has been characterized by dulness during the past week. Benzols have lost the position they had attained, and are to-day quoted lower, without buyers. Anthracene is also weaker, and is offered at 1d. to 1½d. per unit lower. A little more life has been infused into carbolic; and the exceedingly low price at which it can be procured has brought new buyers. An improvement in creosote and tar oils is noted, although a contract for creosote for one of the largest railway companies has been let at a less price than has been paid for several years. There is more enquiry for tar. Most of the contracts are now let for the season. To-day's prices are: Tar, 25s. to 30s. Pitch, 30s. to 32s. Benzol, 90 per cent., 4s. 5d.; 50 per cent., 3s. 4½d. Toluol, 2s. 1d. Solvent naphtha, 1s. 9d. Crude naphtha, 1s. 7d. Creosote, 2d. Heavy oils, 3d. Carbolic acid, 60's, 1s. 7½d. Cresol, 10d. Anthracene, 30 per cent., "A" quality, 1s. 4d.; "B" quality, 1s. 1d.

Sulphate of Ammonia.—Buyers are holding aloof, and very little business has taken place during the week. Stocks are accumulating in some makers' hands. The position appears to be entirely against makers. It is thought there is a conspiracy among German buyers to depress the value. There is a likelihood, however, that home consumers may purchase sooner than usual this season; and this will relieve the market of pressing stocks. According to position, prices are fluctuating between £11 and £11 10s., for 24½ per cent. Gas liquor is quoted—according to terms and conditions of delivery, and strength—from 6s. to 8s.

East Huntingdonshire Water Company, Limited.—A creditor's petition for winding up this Company was in the list for hearing before Mr. Justice North, last Saturday. Mr. Hardy, Q.C., stated that the Court would not be troubled with the matter, as it had been arranged that the petition should be withdrawn; the Company agreeing to pay costs as between solicitor and client. His Lordship assented.

The Lancashire Coal Trade.—Business in the coal trade was brisker during the past week, and prices are now, as a consequence, much steadier. There has been an active demand for the better classes of fuel for house-fire purposes; and common round coal for iron-making and steam users sells freely. For shipmentthere has been more inquiry, and a better business done. At the pit's mouth, best house coal is quoted at 12s. to 12s. 6d. per ton; seconds average 10s. 6d. to 11s.; and common round coal, from 9s. to 9s. 6d. Burgy fetches 7s. 6d. to 8s. per ton; better sorts of slack, from 6s. 6d. to 7s.; and inferior descriptions, as low as 5s. Good qualities of steam coal, delivered at the Liverpool Docks, average about 10s. 6d. per ton, although another 3d. is obtainable by some sellers.

Well-Boring Systems and Pumping Machinery at the Brewers' Exhibition.—At the recent Brewers' Exhibition at the Agricultural Hall, a prominent position was given to three firms whose speciality is the sinking of artesian wells and the pumping of water. The first we noticed among them was the exhibit of engineering appliances by Messrs. Le Grand and Sutcliff, of Bunhill Row, London, E.C. Their "Abyssinian" tube-well system, by Norton's patent, was fully demonstrated, and illustrations were given of various pumping installations in the United Kingdom. This firm have been able to perfect their system after 23 years' practice; and during the present year tube-wells have been sunk at different parts of the country. Messrs. Isler and Co., of Southwark, were also forward with a good show of mechanical appliances at this exhibition. Their system is well known; and is becoming extensively adopted; a number of important installations having quite recently been carried out. Another firm whose name should be mentioned in connection with the exhibition was Messrs. Alfred Williams and Co., of No. 39, Great Eastern Street, E.C., who demonstrated their "Halladay Standard" Windmills, which can be utilized either for pumping water or driving machinery. A feature was made of an automatic regulating apparatus which is supplied for stopping mills when tanks are full.

Local Authorities and Electric Lighting.—Among the local authorities who have recently resolved to promote Provisional Orders to enable them to supply electricity for lighting purposes are: Coventry, Gloucester, Hanley, Heckmondwike, Penzance, Stockport, Weston-super-Mare, and Whitby.

Water-Softening Apparatus at the Brewers' Exhibition.—At the recent Brewers' Exhibition, exhibits of a very varied character were made by the Maignen Filtre Rapide and Anti-Calcaire Company, of No. 43, Commercial Road, E., who demonstrated their various processes of softening water for public and private purposes. A model of the arrangement for the Cornwall Works of Messrs Tangyes Limited, of Birmingham, was on view; and this was similar to that erected at the London and South-Western Railway at Nine Elms. This apparatus is capable of softening 2000 gallons per day, whilst the Maignen plant fixed on the Duke of Norfolk's estate at Arundel passes 30,000 gallons per day. The firm has also put their process into operation at the water-works at Oxford, Bournemouth, and other places. Smaller articles, such as filters, &c., for private use, were shown in great variety, and attracted a large amount of attention.

Northern Coal Trade.—There is still easiness in the coal trade of the north, especially in steam coals. The closing of the Baltic and northern ports, and the delay of steamships by storms, have made some of the collieries work short time, and brought down the prices. For best Northumbrian steam coals, 11s. 6d. per ton has been taken, free on board; but the price more generally asked is 11s. 9d. Small steam coals vary from 6s. to 6s. 3d. Gas coals are in fuller local demand; and the consumption must be expected now to increase daily until the end of the year. A Tyneside contract for next year's supply is in the market; and it is expected to be settled at rates slightly less than those of some of the contracts decided a month ago. For cargoes of gas coal, the price asked generally is from 11s. to 11s. 6d. free on board. Bunker coal is also easier this week. In household coal, there is no alteration in price; but the demand is naturally a little larger. Manufacturing coals are steady; and some contracts over next year are now being concluded. Coke is stronger. The price of best blast-furnace coke is 18s. 6d. to 19s. per ton free on board for this year's delivery, and £1 for the first half of next. Gas coke is unaltered.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 938.)

Issue.	Share	When ex-Dividend.	Dividend for Half-year.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Oct.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c.	10	12—13	..	5 15 6
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	107—109	..	4 11 9
100,000	20	30 May	8	Bahia, Limited	20	20—22	..	7 5 5
200,000	5	15 May	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	5—5⅛	..	5 9 1
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	212—217	..	5 12 11
125,000	,,	,,	9½	Do. New	100	155—160	..	5 15 7
220,000	20	11 Sept.	11½	Brighton & Hove Original	20	40—42	..	5 9 6
320,000	20	28 Mar.	11½	British	20	43—45	..	5 0 0
50,000	10	11 Sept.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—14	..	5 14 3
328,750	10	13 June	8	Buenos Ayres (New) Limited	10	12—13	..	6 3 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	103—106	..	5 13 2
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	10 Oct.	13⅜	Commercial, Old Stock	100	247—252	+2	5 9 1
130,000	,,	,,	10½	Do. New do.	100	198—203	..	5 5 11
130,000	,,	27 June	4½	Do. 4½ p. c. Deb. do.	100	119—124	..	3 12 7
557,320	20	13 June	13	Continental Union, Limited	20	49—50	..	5 4 0
242,680	20	,,	13	Do. New '69 & '72	14	34—36	..	5 1 6
200,000	20	,,	10	Do. 7 p. c. Pref.	20	39—41	..	4 17 7
75,000	Stck.	25 Sept.	10	Crystal Palace District	100	190—200	..	5 0 0
234,060	10	16 July	—	European, Limited	10	18—20	..	—
120,000	10	,,	—	Do. New	10	18—20	..	—
354,060	10	,,	—	Do. do.	7½	14—15	..	—
5,470,620	Stck.	14 Aug.	13	Gaslight & Coke, A, Ordinary	100	234—238	−1	5 9 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	98—101	..	3 19 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	247—252	..	3 19 4
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	119—123	..	4 1 3
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	177—182	..	4 2 5
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	164—168	..	4 3 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	246—251	..	3 19 8
1,061,150	,,	13 June	4	Do. 4 p. c. Deb. Stk.	100	115—120	..	3 6 8
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	123—128	..	3 10 4
650,000	,,	,,	6	Do. 6 p. c. do.	100	161—166	..	3 12 3
3,800,000	Stck.	15 May	12	Imperial Continental	100	220—223	..	5 7 7
75,000	5	13 June	6	Malta & Mediterranean, Ltd.	5	5⅛—5⅜	..	5 4 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	109—111	..	4 10 1
541,920	20	13 June	6½	Monte Video, Limited	20	19—20	..	6 10 0
150,000	5	30 May	10	Oriental, Limited	5	9—9⅛	..	5 5 3
60,000	5	25 Sept.	7	Ottoman, Limited	5	5—5⅛	..	6 7 3
166,870	10	16 July	4	Pará Limited	10	3—4	..	10 0 0
420,000	100	2 May	6	People's Gas of Chicago—1st Mtg. Bds.	100	98—102	..	5 17 8
500,000	100	2 Dec.	6	and Do.	100	95—100	..	6 0 0
150,000	10	10 Oct.	10	San Paulo, Limited	10	15¼—16¼	+⅛	6 1 2
500,000	Stck.	28 Aug.	13½	South Metropolitan, A Stock	100	283—288	..	4 12 0
1,350,000	,,	,,	11½	Do. B do.	100	228—233	+1	4 18 9
141,500	,,	,,	12	Do. C do.	100	235—245	..	4 17 11
650,000	,,	27 June	5	Do. 5 p. c. Deb. Stk.	100	142—147	..	3 8 0
60,000	5	11 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
728,446	Stck.	13 June	9½	Chelsea, Ordinary	100	271—276	+1	3 8 10
1,720,560	Stck.	10 Oct.	7½	East London, Ordinary	100	211—216	..	3 9 5
544,440	,,	27 June	4½	Do. 4½ p. c. Deb. Stk.	100	142—147	..	3 1 2
700,000	50	13 June	9	Grand Junction	50	121—126	..	3 11 5
708,000	Stck.	14 Aug.	10½	Kent	100	271—276	..	3 16 0
1,043,800	100	27 June	9½	Lambeth, 10 p. c. max.	100	252—257	..	3 13 11
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 5
225,000	Stck.	25 Sept.	4	Do. 4 p. c. Deb. Stk.	100	120—124	..	3 4 8
500,000	100	14 Aug.	12½	New River, New Shares	100	361—366	..	3 6 3
1,000,000	Stck.	31 July	4	Do. 4 p. c. Deb. Stk	100	125—128	..	3 2 2
902,300	Stck.	13 June	6	S'thwk & V'xhall, 10 p. c. max.	100	170—174	..	3 9 0
126,500	100	,,	6	Do. 7½ p. c. do.	100	158—163	..	3 13 7
1,155,066	Stck	13 June	10	West Middlesex	100	265—270	..	3 14 1

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams:
"GWYNNEGRAM LONDON."

TELEPHONE No. 2698.

GWYNNE & CO.,

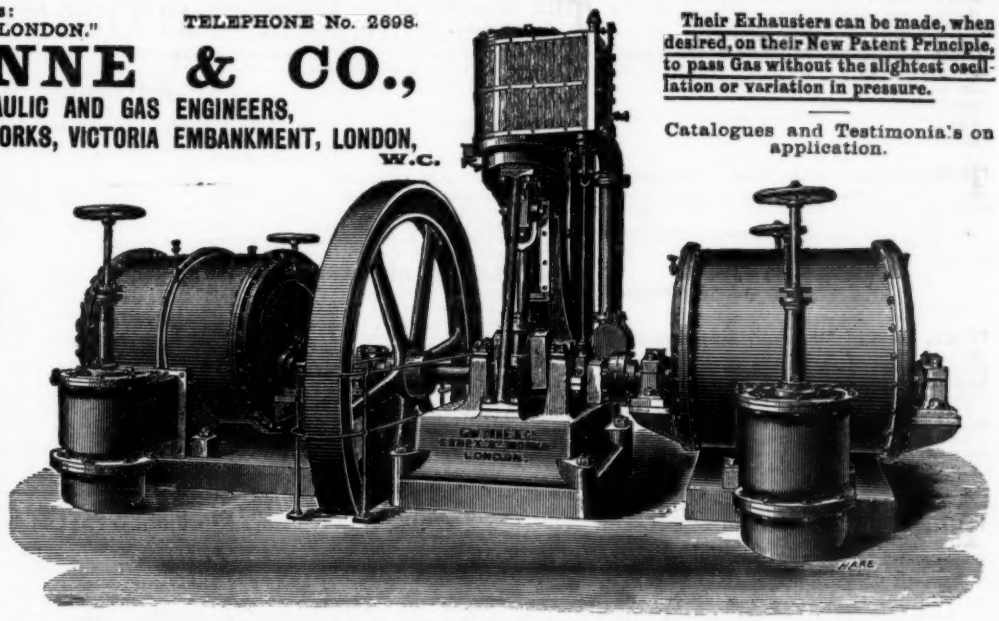
HYDRAULIC AND GAS ENGINEERS,
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have completed Exhausters to the extent of 20,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

Catalogues and Testimonials on application.

Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAYS.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

SULPHURIC ACID.

HUGH WALLACE & CO., Chemical Manufacturers (the old-established firm), supply the above, which is specially adapted for making White Sulphate of Ammonia. The latter purchased in any quantity at highest market prices, or contracts for the year.
For price and terms apply Botolph House, Eastcheap, LONDON, E.C.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 85, Gracechurch Street, LONDON; 70, Wellington Street, GLASGOW; 10, Marsden Street, MANCHESTER; and 96, Reade Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

TAR and Liquor wanted. BROTHERTON AND CO., Commercial Buildings, LEEDS.

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt. Delivered in carboys or railway tank waggons.
For prices and terms address BALE, BAKER, AND CO., 120 & 121, Newgate Street, LONDON.

WANTED, a first-class Gas-Fitter. Apply, stating Age, Wages required, and Experience, with references, to No. 1878, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 963 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

WANTED, a Situation as Working MANAGER of a Small Gas-Works, or FOREMAN of a large one. A good Carbonizer and Fitter (in or out of doors), Main and Service Layer, and can take Meters. Has had 20 years' good experience. Age 35. Married. The highest references can be given.
Apply to No. 1875, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO ENGINEERS.

THE Advertiser, having been Engineer to one of the principal Gas Plant Manufacturers used to Designing and Erecting Plant, with an extensive experience in Gas-Works, and for the past two and a quarter years with the Northampton Gas Company, will shortly be open for an appointment, at Home or Abroad, as ASSISTANT GAS-WORKS MANAGER.
Apply to Mr. SUGGATE, Elysium Terrace, NORTHAMPTON.

OAKHAM GAS COMPANY.

WANTED, a married Man as Working MANAGER, FITTER, and COLLECTOR. Security required, £100. Free Residence, large Garden, Coal, &c., at the Works.
Apply, stating age, experience, and qualifications, with testimonials, to the SECRETARY, 42, Belvoir Street, LEICESTER.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating price per ton and quantity, No. 1766 care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 982.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS COMPANY, LIMITED, 86-88a, LEADENHALL STREET, E.C.

SULPHURIC ACID delivered in Manufacturers' Tanks or Carboys.
Prices on application to HARDMAN AND CO., Miles Platting, MANCHESTER.

BENTLEY & CO.

MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house 17, NEWTON STREET, PICCADILLY, MANCHESTER.

EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 189 : Coal consumed, 3600 tons. Gas made, 92,880,000 feet; ditto sold, 84,880,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,500 cubic feet per ton; Illuminating Power, 16·3 candles.

WANTED, to purchase a set of three (10 feet square) PURIFIERS, with Valves, Connections, and Wood Grids complete. A STATION METER, to pass from 6000 to 8000 cubic feet of Gas per 24 hours, with 8-inch Bye-Pass and Connections. Also a STEAM-BOILER, about 9 ft. by 4 ft., with Flue in centre All on rail and in good order. State lowest price.
Address, No. 1872, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Steam-Boiler, 9 ft. by 4 ft. (2 feet Flue in centre), with Safety-Valve Gauges, &c., all complete. Equal to new. Too small for present use.
Apply to the GAS WORKS, Littleborough, near MANCHESTER.

ON SALE, at the Atherton Gas-Works, a SINGLE-LIFT GASHOLDER, 40 feet diameter and 14 feet deep, in good condition.

Apply to the CLERK of the Local Board, Atherton, LANCS.

FOR SALE—Wrought-Iron Cylindrical SCRUBBER, 9 ft. by 3 ft. 6 in., Distributor, filled with Boards. HAND PUMP, 2½-inch ram. May be bought cheap.

Apply to T. SETTLE, Manager, Gas-Works, New Mill, near HUDDERSFIELD.

TO INVESTORS.

THE Directors of the Town and County of Poole Gas and Coke Company, Limited, have FOR DISPOSAL 23 4 per cent. PREFERENCE "C" SHARES of £10 each.

This being a safe Investment, early application should be made to the Secretary, who will supply all particulars.

By order.

WILLIAM DAVIS, Secretary.

Gas Office, Poole, Oct. 7, 1890.

THE Huyton and Roby Gas Company are prepared to receive TENDERS for the purchase of the surplus TAR made at their Works during the period ending Oct. 31, 1891.

The probable quantity will be about 120 tons.

The price to be at per ton in the Contractor's Tank Wagons at the Company's Siding, Huyton Quarry.

Tenders to be sent in to the undersigned on or before the 8th of November.

FRED. PRITCHARD,
Secretary and Manager.

SPENT OXIDE, ETC.

THE Huyton and Roby Gas Company invite OFFERS for about 50 tons of SPENT OXIDE. Samples may be had on application. The price to be quoted at per ton f.o.r. at Huyton Quarry.

TENDERS also required for about 35 tons of FRESH OXIDE.

Offers to be sent in on or before the 8th of November.

FRED. PRITCHARD,
Secretary and Manager.

Gas Office, Huyton, near Liverpool,
Oct. 29, 1890.

CORPORATION OF CALCUTTA WATER-WORKS.

TO SLUICE-VALVE MAKERS.

TENDERS are invited for the supply of the following SLUICE-VALVES:—

38 2 inches diameter
64 3 inches diameter
58 4 inches diameter

Specification and form of tender can be seen at the Offices of Messrs. Joseph Quick & Son, C.E., 29, Great George Street, Westminster.

Tenders are to be addressed to the Vice-Chairman of the Corporation of Calcutta, and superscribed "Tender for Sluice-Valves," and forwarded by the Mail leaving England on the 13th of November next.

The Commissioners do not bind themselves to accept the lowest or any tender.

CORPORATION OF CALCUTTA WATER-WORKS.

TO PIPE FOUNDERS.

TENDERS are invited for the supply of the following CAST-IRON, TURNED AND BORED PIPES, viz.:—

14,000 yards, 4 inches diameter
18,830 yards, 3 inches diameter
12,470 yards, 2 inches diameter

Drawings, specification, and form of tender can be seen at the Offices of Messrs Joseph Quick & Son, C.E., 29, Great George Street, Westminster.

Tenders are to be addressed to the Vice-Chairman of the Corporation of Calcutta, and superscribed "Tender for Pipes," and forwarded by the Mail leaving England on the 13th of November next.

The Commissioners do not bind themselves to accept the lowest or any tender.

BRISTOL WATER-WORKS COMPANY.
AUTHORIZED CAPITAL, £1,705,000.

SALE BY TENDER OF £50,000 7 PER CENT. MAXIMUM ORDINARY STOCK.

MINIMUM PRICE, £140 PER CENT.

THE Company are prepared to receive TENDERS for the above STOCK on or before the 14th of November, 1890. The Stock to be paid up in full by the 21st of December, 1890.

Particulars and conditions of sale and forms of tender can be obtained at the Company's Office, Small Street, Bristol.

By order.

BY ORDER OF THE TRUSTEES OF THE LATE R. J. DICKINS, ESQ.

CROYDON GAS COMPANY.

Sale of 632 Shares in the Croydon Gas Company, producing Dividends at the rate of 14 and 11 per cent. per annum respectively.

THURGOOD and MARTIN have received instructions to SELL BY AUCTION at the Greyhound Hotel, High Street, Croydon, on Thursday, Nov. 6, 1890, at Six o'clock precisely, in 64 Lots, *cum div.*, 294 SHARES (£5 fully paid), producing Dividends at the rate of 14 per cent. per annum, and 338 SHARES (£5 fully paid), producing Dividends at the rate of 11 per cent. per annum, all in the Capital of the Croydon Gas Company.

An excellent opportunity for the secure investment of large or small sums; the Dividends being well secured against fluctuation by ample Reserve and Insurance Funds.

Particulars and conditions of sale may be had of Messrs. LOVELL, SON, and PITFIELD, Solicitors, 3, GRAY'S INN SQUARE, W.C.; at the place of Sale; and of the AUCTIONEERS, 27, CHANCERY LANE, W.C.

TO INVESTORS, TRUSTEES, AND OTHERS.

ISSUE OF DEBENTURE BONDS.

THE Directors of the Swansea Gas-light Company are now issuing DEBENTURE BONDS, in sums of £100 up to £1000 to suit investors, for three, seven, or ten years, at 3½ per cent. interest per annum, payable half-yearly, secured on the Undertaking of the Company.

By order,
THORNTON ANDREWS, Secretary.

Swansea, Oct. 23, 1890.

RE ALFRED HARTWELL, ESQ., DECEASED, AND OTHERS.

Stocks and Shares in Gas and Water Companies—viz., West Ham Gas Company, 84 Shares; Barnet Gas and Water Company, £991 of Stock and 19 "D" Shares; Woking Water and Gas Company, 119 Shares Horley Gas Company, 20 Shares.

MR. ALFRED RICHARDS will sell the above by AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, Nov. 11, 1890, at Two o'clock precisely, in convenient lots.

Particulars of sale may be had of J. E. SHAW, Esq., Solicitor, 88, London Road, GREENWICH, and 59 and 60, CHANCERY LANE, W.C.; and of the AUCTIONEER, TOTTENHAM, and 8, NEW BROAD STREET.

BARGAINS in all Kinds of Things obtained through "THE BAZAAR, EXCHANGE AND MART," which is extensively used by *Private Persons* to dispose of, either by Exchange or for Cash, any Article they no longer want. "THE BAZAAR" also contains a great deal of most Interesting and Useful Literary Matter of service to all, with Illustrations.

Price 2d. Of all NEWSAGENTS, or direct from the OFFICE, 170, Strand, LONDON, W.C.

FOR Distribution among Gas Consumers or at Exhibitions.—A 4pp. Leaflet entitled "THE USE OF GAS-STOVES IN OUR HOMES;" being a reprint of an article from the *Home Provider*. Price 3s. 6d. per 100 Special quotations for larger quantities, and, if required, for printing Gas Company's own announcement on first or last page. Specimen copy, free by post, 1½d.

The Leaflet is very suitable for distribution among Gas Consumers in the provinces, as it shows the great progress which is being made in the use of Gas for Cooking and Heating in London, and points out, briefly and clearly, the many advantages of Gas-Stoves.

May be obtained of S. H. E. FOXWELL, Office of the *Home Circle and Provider*, 48, Temple Chambers, TEMPLE AVENUE, E.C.; and of WALTER KING, 11, Bolt Court, FLEET STREET, E.C. 2870

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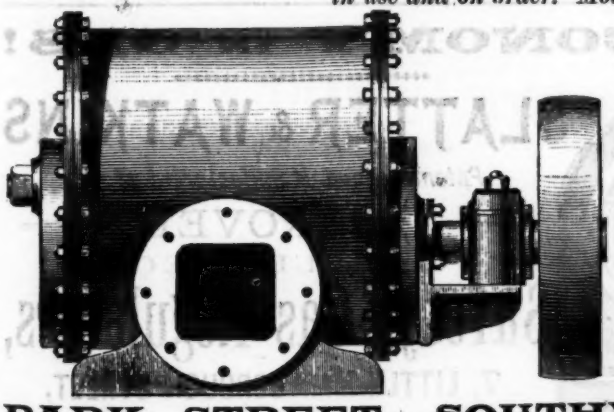

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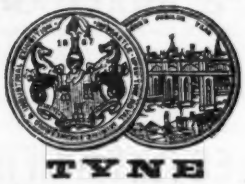

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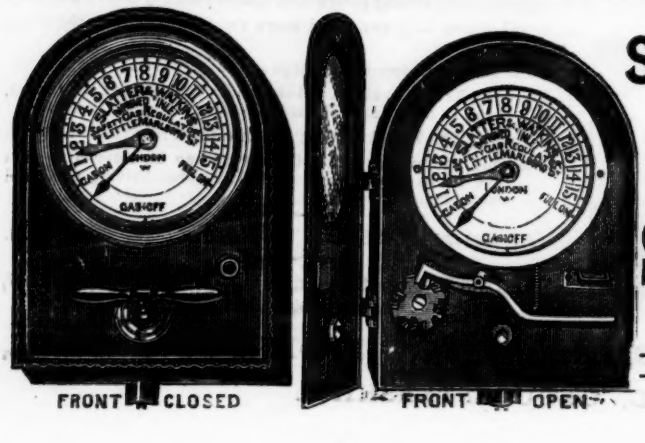

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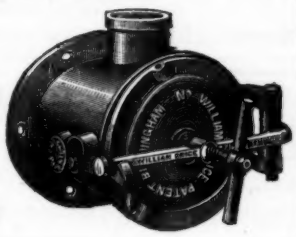

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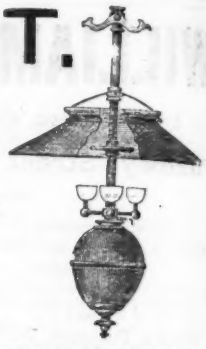

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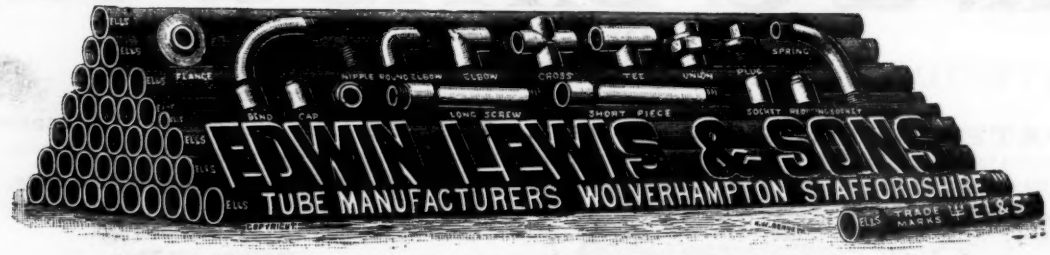

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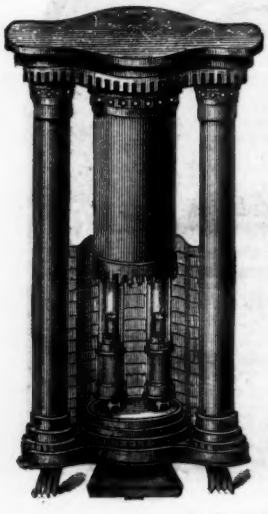

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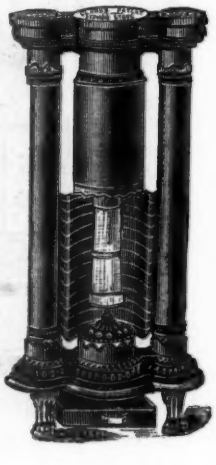

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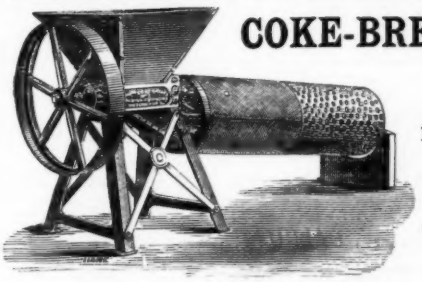
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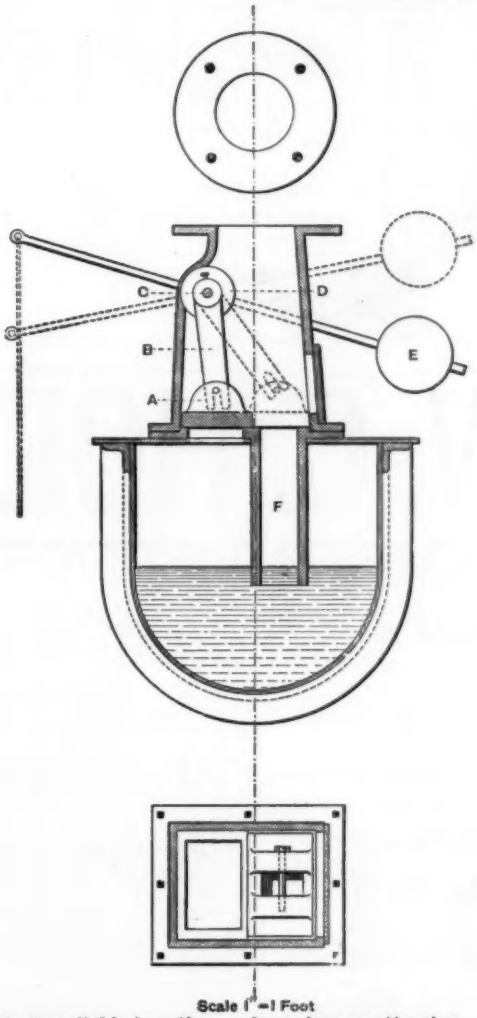

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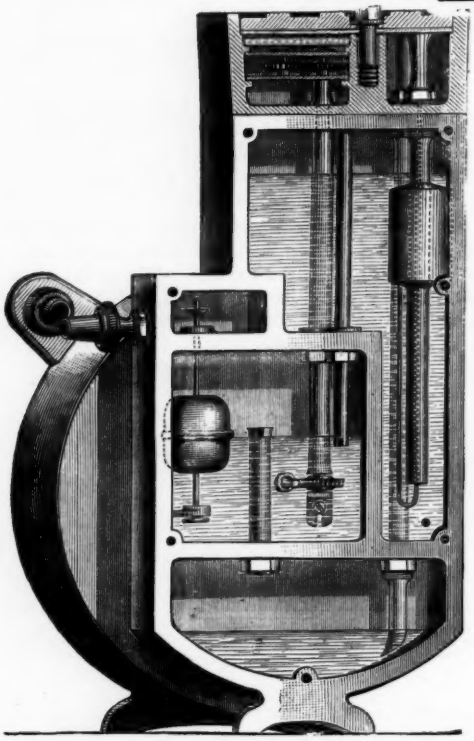

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Patent Rotary Scrubber-Washer.

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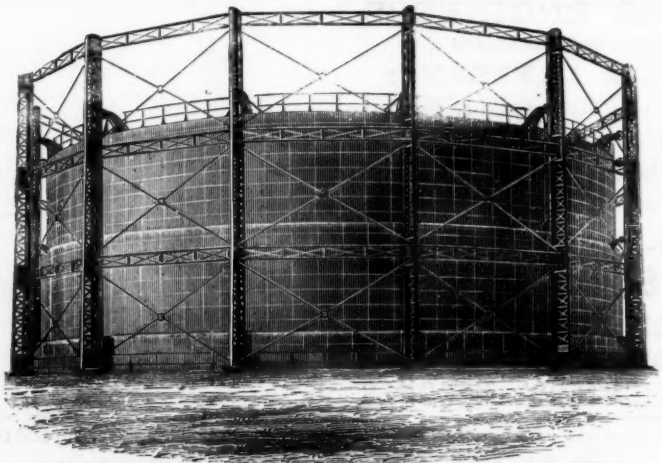
Patent Regulator.

Patent Anti-Dip Pipes.



Treble-Lift Gasholder, 130 ft. by 66 ft., as erected at Burton-on-Trent, 1889.

SOLE MAKERS OF

DRAKE'S PATENT

GAS PLANT

Specially adapted for Country Places, and for mixing with Coal Gas to increase Illuminating Power.

Condensers, Scrubbers, Purifiers, and all Fittings for Gas-Works.

IMPROVED CHEMICAL PLANT.

Telegrams: "Holmes Huddersfield." "Ignitor London."

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AND

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NEW REGENERATIVE GAS-FIRE

(FOULIS' PATENT)

Made in two sizes 24 and 28 inches wide over base.

MADE ALSO AS COMBINED REGISTER STOVE. (See last Week's JOURNAL.)

Designed and perfected by the Patentee,

WILLIAM FOULIS, Esq., C.E.,

GLASGOW CORPORATION GAS-WORKS.

Proved to be the most efficient Stove in use.
Heat easily Maintained.

Made by CARRON CO.

Wholesale Agents:

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PARTICULARS ON APPLICATION.

R. & J. DEMPSTER,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER,

MAKERS AND ERECTORS OF

PATENT COLUMNLESS GASHOLDERS,

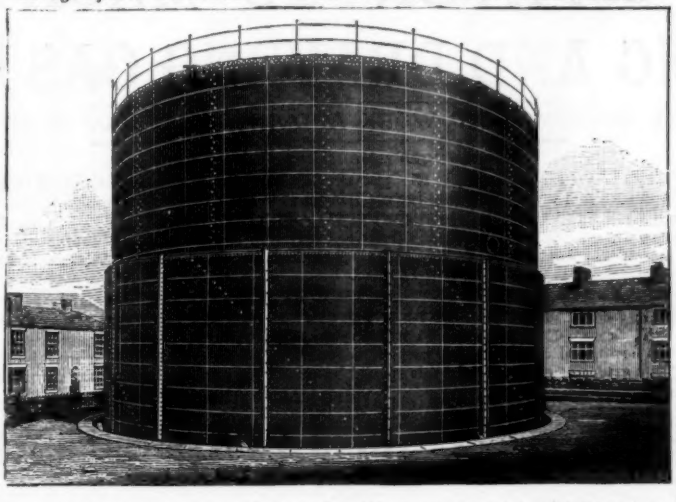
(GADD AND MASON'S) PATENT.

Telegraphic Address: "SCRUBBER MANCHESTER."

TOTAL WEIGHT REDUCED
from 30 per cent. to 50 per cent.

TRANSPORT AND ERECTION REDUCED
to the same extent; and in cases where gasholders are shipped abroad to places difficult of access, this represents a very large amount of money.

TANK CONSTRUCTION SIMPLIFIED.
The Tank wall (of whatever construction) is a regular cylinder. There are no piers needed, and all expensive foundation stones for the base of columns or standards are dispensed with.



Two-Lift Gasholder erected at the Gas-Works, Northwich, which has been in continuous work since Jan. 3, 1890, and has been subjected to most severe tests from heavy gales, with perfectly satisfactory results.

COST OF PAINTING SAVED
for the Columns and Girders.

TILTING UTTERLY IMPOSSIBLE;
And as there are fewer parts, there is less liability for the Gasholder to get out of order in working.

STABILITY UNDER WIND PRESSURE
of a Gasholder constructed upon this system is at least equal to, and from experiments and calculations made is far in excess of, that of a Holder of the same dimensions guided by the elaborate guide framing at present in use.

The removal of heavy guide carriages and rollers from the top curbs considerably lowers the centre of gravity of the structure, and dispenses with the extra strength of sheeting necessary to carry these at the points where they are attached to the gasholder.

The plan adapts itself to telescoping to any reasonable extent, and enables very shallow holders or lifts to be employed with perfect stability.

For further particulars and estimates, apply to the above, or to

THE PATENT GASHOLDER SYNDICATE, 504, STOCKPORT ROAD, MANCHESTER.

THE SILICA FIRE-BRICK COMPANY,

OUGHTYBRIDGE, NEAR SHEFFIELD.

Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

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SILICA FIRE-BRICKS,

(TRADE MARK "SILICA")

Specially adapted for Siemens-Martin Gas-Furnaces; also for Gas, Copper, Iron, Steel, and other Furnaces where intense heat is required.

BESSEMER GANNISTER, STEEL-FURNACE GANNISTER, COPPER-FURNACE GANNISTER, IRONFOUNDERS' CUPOLA SAND, FINE-SETTING SILICA CEMENT, STEEL MOULDERS' COMPOSITION.

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

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First Order of Merit and Medal.

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WELDED IRON TUBES AND FITTINGS

FOR GAS, STEAM, WATER, &c.

LAP-WELDED TUBES

FOR LOCOMOTIVE, MARINE, AND STATIONARY BOILERS, AND OTHER PURPOSES.

HYDRAULIC AND HOT-WATER TUBES.

COILS OF ALL SIZES AND SHAPES.

Stocks, Taps, Dies, Taper Telegraph Poles, &c., &c.

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WEST'S GAS IMPROVEMENT Co., Ltd.,

Engineers, Ironfounders, & Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER **160** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

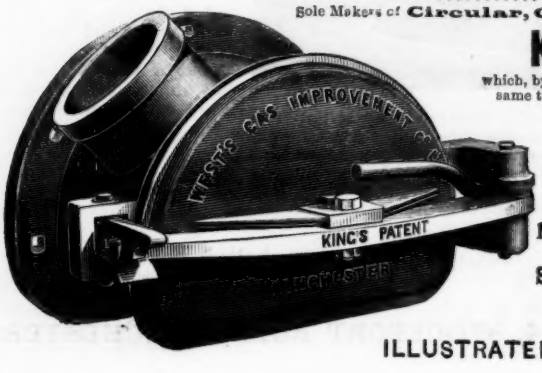
Advantages attending its use are:—

INCREASED VOLUME of GAS per TON, and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE per Ton** of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by WIRE ROPE, STEAM, or COMPRESSED AIR.—The power machines are applicable to circular, oval, or Ω-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made. They are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.



Sole Makers of **Circular, Oval,** or Ω-shaped **Mouthpieces,** with Morton's Self-Sealing Lids fitted with

KING'S PATENT FASTENINGS,

which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and at the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

N.B.—The whole of these Fittings are made of Wrought Iron.

Estimates and further particulars forwarded upon application for Mouthpieces complete, or for Lids and Fastenings separately.

Makers of THOMAS & SOMERVILLE'S COKE-BREAKING MACHINE.

Sole makers of WHITE'S PATENT AUTOMATIC GAS-VALVE.

Mr. JOHN WEST, M. Inst. C.E., *Managing Director.*

ILLUSTRATED CATALOGUE SENT UPON APPLICATION.

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OLD KENTUCKY BOGHEAD

OF KENTUCKY, U.S.A.

These Cannels will rank with the Australian Shale for Gas Manufacture.

Also General Sales Agents for

PENNSYLVANIA & VIRGINIA GAS COALS, & AMERICAN FOUNDRY & FURNACE COKE.

Delivery Prices made to any Port in

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Full Information furnished upon Application to the above Address.

CHEAP STEAM — FOR — GAS-WORKS.

MASON'S PATENT FURNACE

Can be applied to any kind of Boiler.

It improves the draught.
Economises time in raising steam.
Gives steam quickly at any pressure.

THE ONLY FUEL recommended is

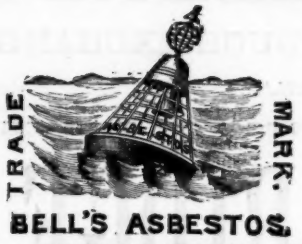
COKE DUST,
COAL DUST,
CINDERS,
SAWDUST,
BREEZE,

Or any other Refuse Fuel.

W. F. MASON,

ENGINEER and PATENTEE,
Longsight, MANCHESTER.

BELL'S ASBESTOS

AQUOL  PAINT

IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY 40 PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

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SOUTHWARK, LONDON, S.E.

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AGENTS—BIRMINGHAM: BELL and Co., 7, John Bright Street. BRISTOL: ROBERT STOTESBURY, 114, Redcliffe Street. CARDIFF: BELL and Co., West Bute Street.

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EXPANSION SHEETING.

The above, which can only be obtained from this house, is recognized as the **most efficient and economical jointing material in use.** It is composed of a specially-prepared India-rubber Compound, protected by a covering of Vulcanized Asbestos Sheeting, as shown above; and as it is the only Jointing Material which adequately **combines permanent elasticity with heat resistance,** the advantage it possesses will at once be seen.

EXPANSION RING.

The centre from which the requisite elasticity is obtained will adapt itself to uneven surfaces to which it may be applied, and allow the expansion and contraction to be fully taken up. The covering being of Asbestos Cloth imparts a protection to the centre, and so prolongs its elasticity. **For Manhole, Mudhole, Steam Pipe, and Mash Tun Door Joints, it is unequalled;** and if applied as directed, **a ring can be used many times over.**

Made from 1-Ply for Cylinder and Faced Joints to any thickness for Uneven Surfaces.

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DUBLIN, BERLIN.
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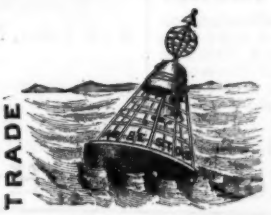

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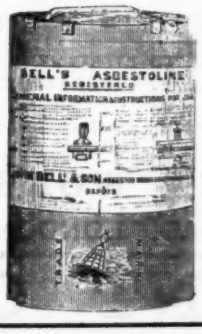
YARN AND SOAPSTONE PACKING
the BEST LOCOMOTIVE PACKING made.

BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for
Hydraulic Machinery, Accumulators and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.

BELL'S ASBESTOLINE
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

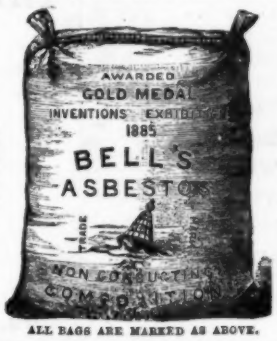
ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.



ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.
Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS
"DAGGER" PACKING
Is unequalled for every kind of Marine and Land Engine, Steam-Pumps, &c., and has proved itself to be the most efficient durable, and economical Packing made.

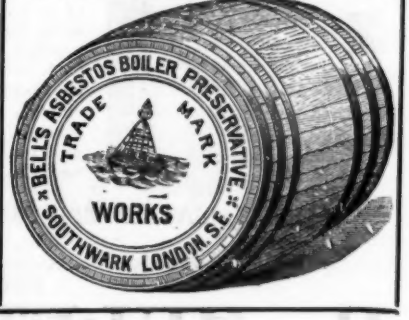
BELL'S ASBESTOS
NON-CONDUCTING COMPOSITION.
Will reduce loss by radiation and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



ALL BAGS ARE MARKED AS ABOVE.

Can be Applied Again after many years' service. Is sent out Dry in Bags: therefore cheaper than other Compositions sent out wet.

BELL'S ASBESTOS
BOILER PRESERVATIVE
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



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NEW HIGH-POWER GAS-LAMP.

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

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GAS COAL.

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FACE YOUR RETORT MOUTHPIECES.

JOHN RUSCOE calls attention to his Retort Mouthpiece and Lid Facing Machines, which are in extensive use; also to his Lathes, Drilling, Slotting, Grooving, and Planing Machines, Smiths' Hearths, Smithy Fans, Roots' Blowers; also special Screwing Machines for Gas Tubes and Bolts, Taps, Wrenches, Pipe Cutters, special Taper and Twisted Rymers, Drills, &c.

PATENT TWISTED TAPS, DIES, & CUTTERS.

Thousands in constant work, give universal satisfaction.

Work Easier, Less Friction, Last Longer, and do Better Work than straight Grooves.

Main Drilling Stand, with Cup Drills, 1½ to 6 inch; Taps, Rymers, and Drills.

Ratchet Screwing Stocks, and Adjustable Once-up Stocks, Dies, Guides, &c.

Inquiries and Trial Orders Solicited. Everything Guaranteed. Apply to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

Cheapest and Best in the Market.

No. 5 burns 5 to 7 ft. of Gas per hour; and No. 10, 10 to 12 ft.

Priced complete with Governor, Bye-pass Tap, &c.

THE POPULAR.

Iron-decorative Body with Enamelled Tube and Consumer.
No. 5 45s. each,
No. 10 68s. „

The

LAMP MANUFACTURING COMPY.,

LIMITED.

Sole Licensees of

THE FULLFORD GAS-LAMP

(PATENT).

The flame of the Fullford Lamp when first lighted goes immediately into action without any explosion; and after a few minutes, burns with great steadiness and brilliancy.

AGENTS WANTED EVERYWHERE.
LARGE DISCOUNT. LIBERAL TERMS.

Price List forwarded Free on Application.

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THE FRAME.

Electro-bronzed Body and Frame with painted Enamelled Tube. Very elegant.
No. 5 85s. each.
No. 10 100s. „

Simple, Economical, Reliable,

Easy to light as an ordinary Flat Flame Gas-Burner.

Save your Gas and your Eyes.

PREPAYMENT GAS-METER.

(PRICE'S PATENT).

This Meter has a simple Automatic arrangement fitted, whereby, upon the insertion of a shilling, a supply of gas can be obtained, and which is cut off on the quantity paid for being consumed. The Meter gives warning when the quantity is nearly exhausted, so that another shilling may be inserted. There is, however, no occasion to wait until this happens, as a second shilling can be inserted after two-pennyworth of the first shilling has been consumed.

The Meter is fitted with the ordinary registering dial, and has in addition a circular one divided showing twelve pence. On each Meter is marked the number of cubic feet it will pass for one shilling; and this can be arranged to cover cost of Meter-Rental, Fitting, and Gas consumed. These Meters are made of the best material and workmanship.

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONGST SMALL CONSUMERS.

NO RISK OF BAD DEBTS.

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D. HULETT & Co., LIMITED,

GAS-METER MAKERS, 55 & 56, HIGH HOLBORN, LONDON.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR
DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,
NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).
Can be fixed in a few minutes.

May be seen at the Offices of the
SCHÜLKE GAS-LAMP Co.
LIMITED,
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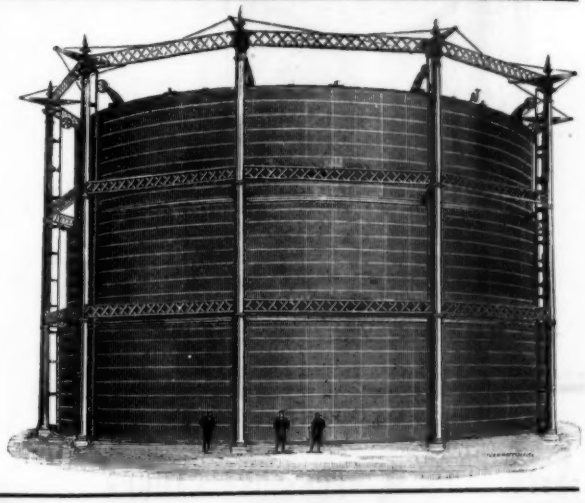
LONDON, W.C.,
Where Price Lists and full particulars may be obtained.

Wrought-Iron
TUBES
And Fittings and Accessories.

LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c.; AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: T. LAMBERT & SONS, Short Street, LAMBETH.

HANNA, DONALD, & WILSON,
(Established 1851),
GAS ENGINEERS & CONTRACTORS,
Abercorn Foundry and Abbey Works,
PAISLEY, N.B.,
MAKERS OF
Gasholders and Gas Plant
OF EVERY DESCRIPTION.

Telegraphic Address: "Donald Paisley."



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GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.
London Offices: 6 & 7, KING WILLIAM STREET, E.C.
MANUFACTURERS OF EVERY DESCRIPTION OF
GAS APPARATUS,

GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

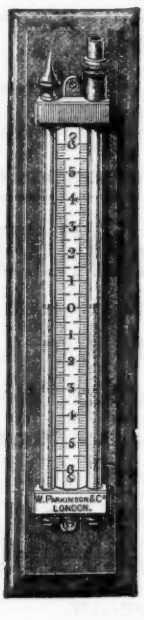
which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

W. PARKINSON & Co.
Gas Engineers.

PRESSURE-GAUGES
MOUNTED IN SETS OR IN POLISHED WOOD CASES.

(FOR COMPLETE LIST OF GAUGES SEE CATALOGUE.)



Designed by C. HUNT, Esq., M. Inst. C.E.

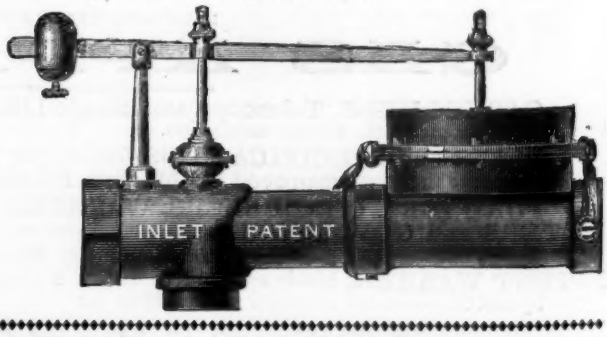
PRESSURE-GAUGES
IN EVERY SIZE AND STYLE.

SOLE [MAKERS] FOR SOUTH OF ENGLAND AND IRELAND FOR

BEECHEY'S PATENT

ANTI-FLUCTUATOR
FOR GAS-ENGINES.

A Complete Cure for the Oscillation of Gas in the Main.



COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address: "PRECISION."

[See also advt. p. 934

London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Nov. 4, 1890.